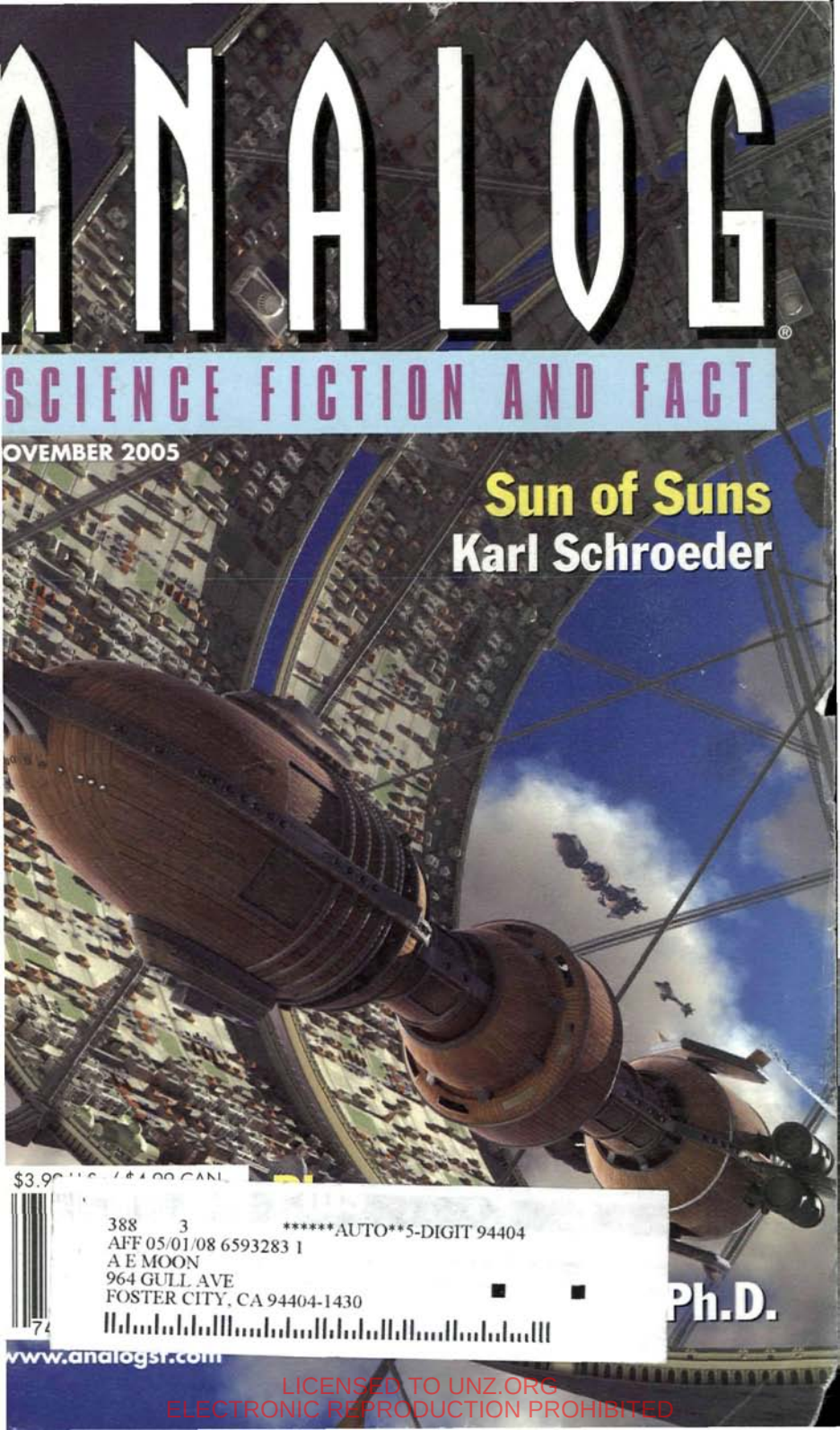
ANALOG

SCIENCE FICTION AND FACT

OVEMBER 2005

Sun of Suns
Karl Schroeder



$3.9[illegible] / $4.99 CAN

388 3 ******AUTO**5-DIGIT 94404
AFF 05/01/08 6593283 1
A E MOON
964 GULL AVE
FOSTER CITY, CA 94404-1430

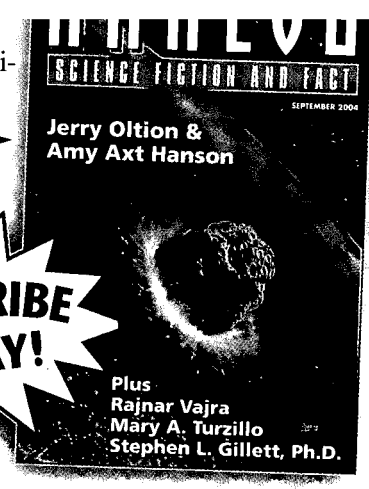
Ph.D.

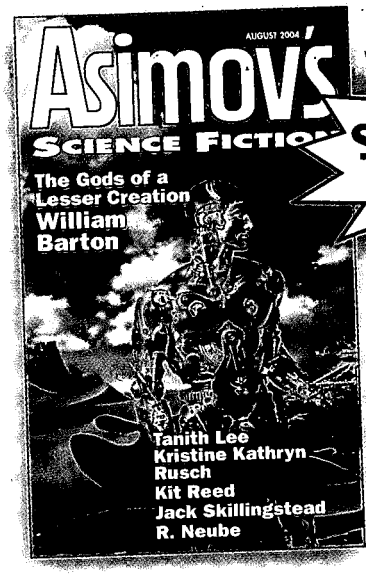
www.analogsf.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

fiction stories, provocative editorials, and fascinating articles, all solidly rooted in science fact. 1 year (12 issues*), just $32.97!

Visit **www.analogsf.com** →





SUBSCRIBE TODAY!

Asimov's Science Fiction

Novellas and short stories from the leading science fiction and fantasy writers. Plus, candid, no-holds-barred book reviews and guest editorials. 1 year (12 issues*), just $32.97!

← Visit **www.asimovs.com**

To order by charge card, call
TOLL-FREE: 1-800-220-7443 (9am - 5pm EST)

or mail your name, address, order, and payment to:

Dell Magazines Direct
6 Prowitt St., Suite S • Norwalk, CT 06855-1220

Please allow 4 to 6 weeks for delivery of your first issue. Outside U.S.A.: Add $10 per year, per subscription for shipping and handling. All orders must be paid in U.S. funds. *We publish double issues twice a year which count as four issues toward your subscription. Expires 9/30/06.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

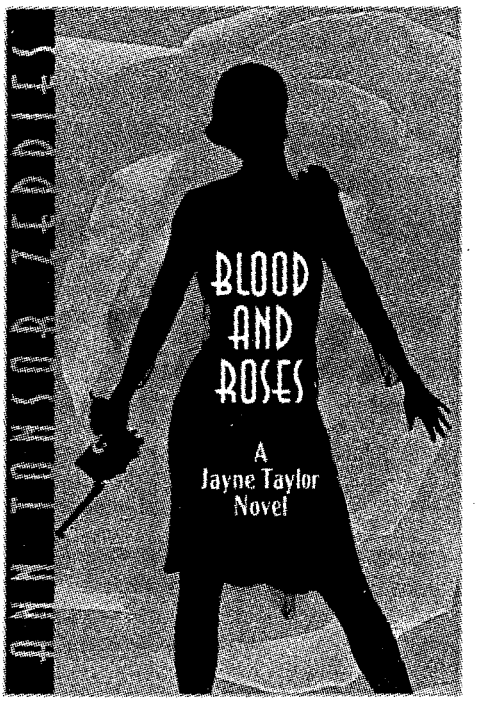
35C-NSFSLL

THIS FALL . . .
PHOBOS IMPACT PROUDLY PRESENTS:

"Take a dollop of H.G. Wells, mix well with Raymond Chandler, shake it up with Emma Peel from the Avengers, spice it all with Zeddies's unique voice, and you have one delicious page turner. I couldn't put it down. "
– Catherine Asaro,
Nebula Award winning author of *The Quantum Rose*

"Featuring gee-whiz gadgets, secret agents, gangsters, and a gun-toting heroine, this is a hard- charging fast-paced read."
– Sharon Lee and Steve Miller, bestselling creators of the *Liaden® Universe*

"Jayne Taylor is tomorrow's heroine – yesterday! *Blood and Roses* is a Jazz Age version of The X-Files."
– Greg Cox, *New York Times* bestselling author of *THE EUGENICS WARS.*



Blood and Roses
A Jayne Taylor Novel
Ann Tonsor Zeddies
Trade Paperback: $13.95: 0-9720026-7-7
On Sale November 16
World War I heroine Jayne Taylor must battle invading aliens threatening the destruction of 1920s Earth.
From the two-time *Philip K. Dick Award* nominee.

PHOBOS IMPACT . . . IMPACTING THE IMAGINATION

PHOBOS IMPACT
An Imprint of Phobos Books LLC, 200 Park Ave South, New York, NY 10003
Voice: 347-683-8151 Fax: 718-228-3597
Distributed to the trade by National Book Network 1-800-462-6420

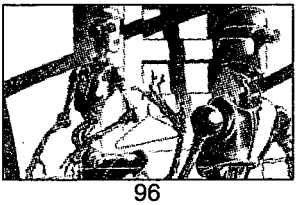
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ANALOG®

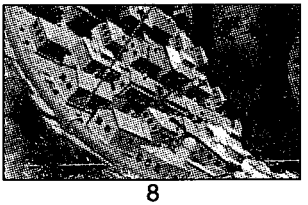
SCIENCE FICTION AND FACT

Vol. CXXV No. 11
November 2005

Next Issue on Sale
October 11, 2005



96



8

SERIAL

SUN OF SUNS, Karl Schroeder ____ 8

NOVELLA

THE DIVERSIFICATION OF ITS FANCY, John Barnes ____ 96

NOVELETTE

THE CASE OF THE CONTUMACIOUS QUBIT, Thomas R. Dulski ____ 66

SHORT STORY

911-BACKUP, Richard A. Lovett ____ 66

SCIENCE FACT

RETIREMENT HOMES OF THE GODS, Stephen L. Gillett, Ph.D. ____ 50

PROBABILITY ZERO

KEEPING TRACK, Richard Foss ____ 95

READER'S DEPARTMENTS

THE EDITOR'S PAGE ____ 4
IN TIMES TO COME ____ 138
THE ALTERNATE VIEW, Jeffery D. Kooistra ____ 92
THE REFERENCE LIBRARY, Tom Easton ____ 133
BRASS TACKS ____ 139
UPCOMING EVENTS, Anthony Lewis ____ 144

Stanley Schmidt Editor — **Trevor Quachri** Associate Editor

Cover design by Victoria Green — Cover Art by George Krauter

Indicia on Page 5

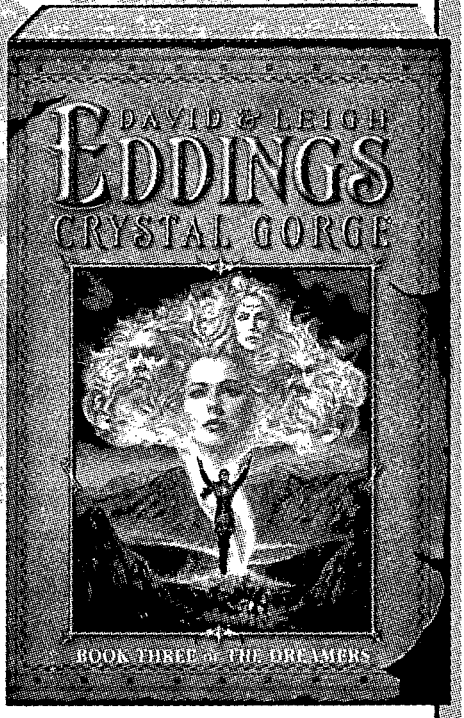
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

New from Aspect—Book Three of The Dreamers

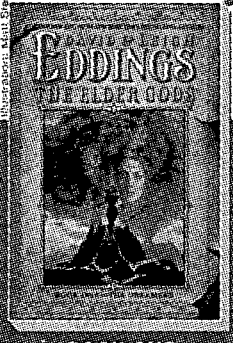
THE EPIC FANTASY CONTINUES FROM *NEW YORK TIMES* BESTSELLERS DAVID & LEIGH EDDINGS

The Vlagh is back-and she's breeding again. But this time, they aren't venomous bugs. They're almost human-and evolving in ways mankind could never have imagined....

"Eddings is one of the best fantasy writers publishing today.
—Orlando Sentinel



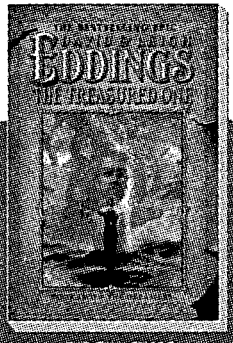
AVAILABLE IN HARDCOVER



BOOK ONE

NOW AVAILABLE IN PAPERBACK

A winning combination of congenial characters, beastly villains, and top-notch storytelling.
—Library Journal on The Treasured One



BOOK TWO

ASPECT
WHERE IMAGINATION KNOWS NO BOUNDS
Time Warner Book Group Read an Excerpt Online at www.twbookmark.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

EDITORIAL Stanley Schmidt

DIFFUSE TYRANNY

The latest wrinkle to come to my attention in our country's current rush toward an "Inquisition" mentality is a growing tendency for pharmacists to refuse to fill prescriptions for birth control pills because of their personal religious or moral beliefs.

"Their," in this case, meaning the pharmacists', not the patients'. In other words, pharmacists are taking it upon themselves to forbid patients to do things completely within their legal rights and not affecting the pharmacists at all. As I write this, some states are considering legislation to guarantee pharmacists their "right" to do this, while others are considering legislation requiring them to fulfill their "duty" to fill all prescriptions.

Another tendency on which I commented recently (October 2005) may at first glance seem unrelated, but is in important ways quite similar: the growing number of school teachers and officials who take it upon themselves to effectively remove evolution from the biology curriculum by refusing to teach it, even when the "official" curriculum says it's supposed to be taught.

There have been other examples, and I suspect we'll be seeing more as time passes. But where are we headed, if this goes on? What happens if we allow ordinary individuals rather than laws to dictate what products or services other people can get?

You might try to shrug off the problem by saying nobody has to do things that violate his or her conscience, and that if you insist on studying evolution you can do it on your own, and that if one pharmacist turns you away you can go to another. But the real world is not that simple.

Yes, you can study evolution on your own—if you know that you want to. But (a) most people in this country are not very good at studying things on their own (our educational and credentialing system actively discourages the belief that they can), and (b) many people will never suspect that they might *want* to learn something unless they've had at least a little exposure to it in school. Providing such exposure is, in fact, is one of the main functions of schools.

You *can't* write or fill your own prescriptions, so the "do it yourself" argument, weakly tenable as it is for evolution, fails completely here. If you want a prescription filled, you have no choice but to go to a pharmacist. If your local pharmacist has appointed him—or herself to overrule your physician, and you live in a small town in a sparsely populated area, going to another is not a realistic option. In such a case, a decision that should be made by you and your doctor is instead made unilaterally by your pharmacist, cutting both of you out of the loop.

This, I respectfully submit, is the height of arrogance. It's none of his or her business. He or she is employed to fill whatever legally written prescriptions are presented.

"But what of religious freedom?" you

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

may ask. "That's one of the cornerstones of our country. Doesn't that mean the pharmacist is free to follow his own beliefs, even if that means refusing to dispense a medicine he believes to be immoral?"

Simple answer: No, it does not. The crucial point most people seem to find inordinately difficult to grasp about *any* kind of freedom is that it can never be absolute. If everyone is to be allowed as much freedom of _____ as possible, that can only be achieved if everybody's freedom extends to, and not beyond, any point at which it begins infringing on somebody else's. Neither you nor I can reasonably be allowed to do absolutely anything we want; we can only be allowed to whatever we want that does not restrict somebody else's freedom to do the same.

A pharmacist whose religion frowns on birth control pills has no obligation to use them—and no right to interfere with someone else whose religion doesn't forbid them. A science teacher whose faith makes him or her unable to believe in evolution despite the scientific evidence is free to disbelieve, but is not excused from teaching what science says and why.

History has provided several thousand years of empirical evidence that human beings cannot agree about religion. Secular laws are the one body of guidelines that we all can and must agree on, however grudgingly. One of the most important of those guidelines says that those who hold one set of religious beliefs may not dictate the actions or beliefs of those who hold a different set (or none).

And that one is in serious danger right now.

The small-town woman who can't get her prescription filled may be in even worse shape than having to drive 90 miles to the next town. That town may be no different. We already have sizable areas where that narrow subset of Christians called "Fundamentalists" constitutes an increasingly aggressive majority. If all (or even most) of the pharmacists or teachers in a region quietly decide to do what they want rather than what the law says, then the protections nominally provided by the law have become meaningless. In such a situation, much of what people can do, and what is done to them, is determined not by constitutional law, even if such law exists on paper, but *de facto* by an unofficial and unregulated "diffuse tyranny" of people imposing their personal beliefs on others who do not share them.

Simple answers, of course, tend to be simplistic. No discussion of this problem would be complete without taking a look at things from the pharmacist's or teacher's point of view. When should somebody with a deeply ingrained sense of moral values do something that clashes with those values, such as dis-

Analog Science Fiction and Fact (Astounding), Vol. CXXV, No. 11, November 2005. ISSN 1059-2113, USPS 488-910, GST# 123054108. Published monthly except for combined January/February and July/August double issues by Dell Magazines, a division of Crosstown Publications. One-year subscription for $43.90 in the U.S.A. and possessions, in all other countries, $53.90 (GST included in Canada) payable in advance in U.S. funds. First copy of new subscription will be mailed within eight weeks of receipt of order. When reporting change of address allow 6 to 8 weeks and give new address as well as the old address as it appears on the last label. Periodical postage paid at Norwalk, CT and additional mailing offices. Canadian postage paid at Montreal, Quebec. Canada Post International Publications Mail. © 2005 by Dell Magazines, a division of Crosstown Publications, all rights reserved. Dell is a trademark registered in the U.S. Patent Office. Protection secured under the Universal Copyright Convention. Reproduction or use of editorial or pictorial content in any manner without express permission is prohibited. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental. All submissions must be accompanied by stamped self-addressed envelope, the publisher assumes no responsibility for unsolicited manuscripts or artwork.

POSTMASTER: Send change of address to: ANALOG SCIENCE FICTION AND FACT
6 Prowitt Street, Norwalk, CT 06855.

IN CANADA RETURN TO: Quebecor St. Jean, 800 Blvd. Industrial, St. Jean, Quebec J3B 8G4
Executive Office: Penny Press, 6 Prowitt St., Norwalk, CT 06855
Editorial and Advertising: Analog Science Fiction and Fact, 475 Park Avenue South, New York, N.Y. 10016
Subscriptions: Analog Science Fiction and Fact, 6 Prowitt Street, Norwalk, CT 06855.

Printed in Canada

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

pensing medicine or a worldview he doesn't approve of? That's by no means a simple or trivial question. It's not enough to expect a person in such a position to just do it and shrug off personal responsibility by saying, "I was only following orders." We didn't buy it at Nüürnberg, and I hope we're not ready to buy it routinely now—though I feel obliged to add that "following religious convictions" often amounts to following orders from religious leaders, and that's not necessarily a better excuse than following orders from political leaders.

Ultimately all such decisions will be made by weighing some combination of inputs from religion, law, personal conscience, and—we can at least hope—reason. And the process isn't necessarily easy. Some years ago (January 1987) I devoted a whole editorial to this "fundamental dilemma" of civilization: that our "real" government involves a system of "expanded checks and balances," with official governments necessarily enforcing laws as they exist and people trying to get them improved, working within the system where possible and breaking laws when other means have failed.

In practice, my advice to the pharmacist would be to ask: does this really bother you so much, and are you so sure you deserve to dictate somebody else's highly personal decision, that you *can't* fill this prescription? If so, the honorable thing to do is to get out of pharmacy and leave it to people who can recognize that other people have as much right to their religion (or lack of it) as you do. Of course, if too many pharmacists do that, then there'll be a major shortage and we'll have a new problem to deal with—because practically everybody will need a pharmacist sooner or later.

Finding ways to solve that one just may force some of those who felt so righteous about imposing their personal views on others to take a fresh look at the rightness of that stance. And maybe a few more of them will come to realize that there are good reasons for constitutional protection of freedom of religion, and that in practice your freedom to practice your religion *must* end where it conflicts with somebody else's.

I hope so—because if more of us can't relearn that, and we continue to tolerate the present trend, we may soon find we've grown our own "grassroots Taliban."

Won't that be fun? ■

STANLEY SCHMIDT .....Editor
TREVOR QUACHRI.....Associate Editor
MARY GRANT .....Editorial Assistant
VICTORIA GREEN .....Senior Art Director
MEGHAN LEMBO .....Production Assistant
CAROLE DIXON.....Senior Production Manager
EVIRA MATOS.....Production Associate
ABIGAIL BROWNING.....Manager, Subsidiary Rights and Marketing
SCOTT LAIS.....Contracts and Permissions
JULIA McEVOY .....Manager, Advertising Sales
BRUCE W. SHERBOW.....VP, Sales and Marketing
SANDY MARLOWE .....Circulation Services

PETER KANTER
Publisher

CHRISTINE BEGLEY
Associate Publisher

SUSAN KENDRIOSKI
Executive Director,
Art & Production

Published since 1930

First issue of *Astounding*
January 1930 ©

ADVERTISING REPRESENTATIVE Connie Goon, Advertising Sales Coordinator,
Tel:(212) 686-7188 ■ Fax:(212) 686-7414 (Display and Classified Advertising)
EDITORIAL CORRESPONDENCE ONLY analog@dellmagazines.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

New from Aspect

JASON WANDER DEFEATED THE ALIENS AND SAVED EARTH. THAT WAS ROUND ONE.

General Jason Wander sacrificed his team and his lover to win man's only alien conflict, but the invasion was only the beginning. The real assault begins when Earth is attacked by a vast armada of city-sized warships. Earth's only hope for survival: a suicide squad led by the battle-scarred warrior himself.

"RAW AND REAL—AND A HELL OF A GOOD READ."
—Kevin J. Anderson
on *Orphanage*

"BUETTNER SHOWS THE HEINLEIN TOUCH."
—*Denver Post*
on *Orphanage*

"THE NEAR FUTURE [BUETTNER] PAINTS IS AS BELIEVABLE AS IT IS TERRIBLE."
—Joe Haldeman,
author of
The Forever War,
on *Orphanage*

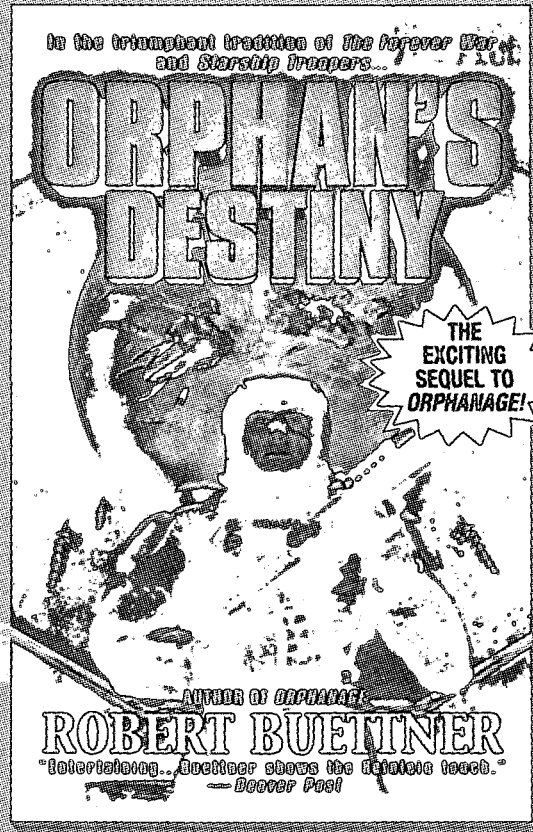

In the triumphant tradition of *The Forever War* and *Starship Troopers*...
ORPHANS DESTINY
THE EXCITING SEQUEL TO *ORPHANAGE!*
AUTHOR OF *ORPHANAGE*
ROBERT BUETTNER
"Entertaining... Buettner shows the Heinlein touch."
—*Denver Post*

Illustration: Fred Gambino

AVAILABLE IN PAPERBACK

ASPECT
WHERE IMAGINATION KNOWS NO BOUNDS
Time Warner Book Group Read an Excerpt Online at www.twbookmark.com

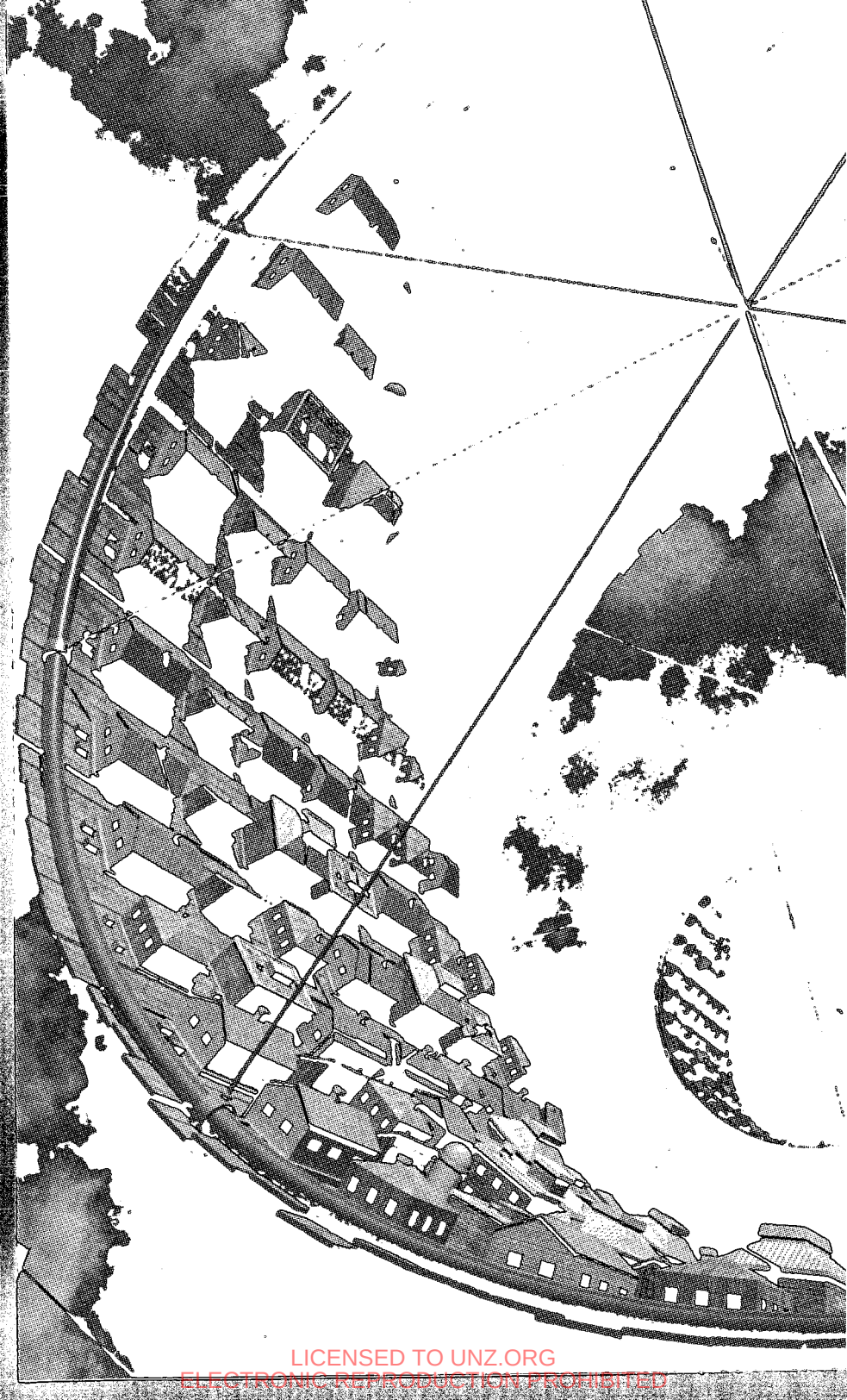
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Vengeance is one
of the oldest
human motivations—
but not necessarily the most
constructive in a complicated world.

Sun of Suns
Part I

Karl Schroeder
Illustration by George Krauter

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

1

Hayden Griffin was plucking a fish when the gravity bell rang. The dull clang penetrated even the thick wooden walls of the corporation inn; it was designed to be heard all over town. Hayden paused, frowned, and experimentally let go of the fish. Four tumbling feathers flashed like candle-flames in an errant beam of sunlight shooting between the floorboards. The fish landed three feet to his left. Hayden watched the feathers dip in a slow arc to settle next to it.

"A bit early for a spin-up, ain't it?" said Hayden. Miles grunted distractedly. The former soldier, now corporation cook, was busily pouring sauce over a steaming turkey that he'd just rescued from the oven's minor inferno. "They might need me all the same," continued Hayden. "I better go see."

Miles snapped out of his reverie and squinted at Hayden.

"Your Ma left you here," he said. "You been bad again. Pick up the fish."

Hayden leaned back against the table, crossing his arms. He was trying to come up with a reply that didn't sound like whining when the bell rang again, more urgently. "See?" he said. "They need somebody. Nobody in town's as good with the bikes as I am. Anyway, how you gonna boil this fish if the gravity goes?"

"Gravity ain't gonna go, boy," snapped Miles. "It's solid right now."

"Then I better go see what else is up."

"You just want to watch your old lady light the sun," said Miles.

"Don't you?"

"Today's just a test. I'll wait for tomorrow, then they light it for real."

"Come on, Miles. I'll be right back."

The cook sighed. "Go, then. Set the bikes going. Then come right back." Hayden bolted for the door and Miles shouted, "Don't leave that fish on the floor!"

As Hayden walked down the hall to the front of the inn another stray beam of sunlight spiked up around the plank floorboards. That was a bad sign; Mom would have to wait for deep cloud cover before lighting the town's new sun, lest the Slipstreamers should see it. Slipstream would never tolerate another sun so close to their own. The project was secret—or it had been. By tomorrow the whole world would know about it.

Hayden walked backwards past the well-polished oak bar, waving his lanky arms casually at his side as he said, "Bell rang. Gotta check the bikes." One of the customers smirked doubtfully at him; Mama Fifty glared at him from her post behind the bar. Before she could reply he was out the front door.

A blustery wind was blowing out here as always, even whistling up between the street boards. Sunlight angled around the edges of the street's peaked roof, bars and rectangles of light sliding along the planking and up the walls of the buildings that crammed every available space. The streetboards gave like springs under Hayden's feet as he ran up the steep curve of the avenue, which was nearly empty at this time of day.

Gavin Town came to life at sunshut, when the workers who slept here flooded back from all six directions, laughing and gossiping. Merchants would unshutter their windows for the night market as the gaslights were lit all along the way. The dance hall would throw open its doors for those with the stamina to take a few turns on the floor. Sometimes Hayden picked up some extra bills by lighting the street lights himself. He was good with fire, after all.

If he went to work on the bikes Hayden wouldn't be able to see the sun, so he took a detour. Slipping down a narrow alleyway between two tall houses, he came to one of the two outer streets of the town—really little more than a narrow covered walkway. Ex-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tensions of houses and shops formed a ceiling, their entrances to the left as he stepped into the way. To the right was an uneven board fence, just a crack open at the top. An occasional shuttered window interrupted the surface of the fence, but Hayden didn't pause at any of them. He was making for an open gallery a quarter of the way up the street.

At moments like this—alone and busy—he either completely forgot himself or drowned in grief. His father's death still weighed on him, though it had been a year now; was it that long since he and his mother had moved here? Mother kept insisting that it was best this way, that if they'd stayed home in Twenty-two Town they would have been surrounded by reminders of Dad all the time. But was that so bad?

His father wouldn't be here to see the lighting of the sun, his wife's completion of his project—their crowning achievement as a family. When Hayden remembered them talking about that, it was his father's voice he remembered, soaring in tones of enthusiasm and hope. Mother would be quieter, but her pride and love came through in the murmurs that came through the bedroom wall and lulled Hayden to sleep at night. To make your own sun! That was how nations were founded. To light a sun was to be remembered forever.

The gallery was just a stretch of street empty of fence, but with a railing you could look over. Mother called it a "braveway"; Miles used the more interesting term "pukesight." Hayden stepped up to the rail and clutched it with both hands, staring.

A gigantic mountain of cloud wheeled in front of him, nearly close enough to touch. The new sun must be behind it; the ropes of the road from Gavin Town to the construction site stabbed the heart of the cloud and vanished inside it. Hayden was disappointed; if the sun came on right now he wouldn't see it.

He laughed. Oh, yes he would. Father had impressed it upon him again and again: when the sun came on, there would be no missing it. "The clouds for miles around will evaporate—poof," he'd said with a wave of his fingers. "The temperature will instantly shoot up—in fact, everything within a kilometer is going to catch fire. That's why the sun is situated so far from any towns. That, and security reasons, of course. And the light . . . Hayden, you have to promise not to look at it. It's going to be brighter than anything you can imagine. Up close, it could burn your skin and dazzle you through your closed eyelids. Never look directly at it, not until we've moved the town."

The cloud turned about Hayden as he gazed at it; Gavin town was a wheel like all towns, after all, and spun to provide its inhabitants with centrifugal gravity. It was the only form of gravity they would ever know, and it was a precious resource, costly and heavily taxed. Grant's Chance, the next nearest town, lay a dozen miles beyond the sun site, invisible for now behind cloud.

Cloud was why the Griffins had come here. At the edges of the zone lit by Slipstream, the air cooled and condensation began. White mist in all its shapes made a wall here separating the sunlit realm from the vast empty spaces of Winter. This was the frontier. Here you could hide all manner of things—secret projects, for instance.

The town continued to turn and now sky opened out beyond the barrier of mist—sky with no limits, either up, down, or to either side. Two distant suns carved out a sphere of pale air from this endless firmament, a volume defined by thousands upon thousands of clouds in all shapes and sizes, most of them tinged with dusk colors of rose and amber. There were ragged

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

streamers indicating currents and rivers of air; puffballs and many-armed star shapes; and many miles away, its outlines blurred by intervening dust and mist, a mushroom head was forming as some current of cold impacted a mass of moist air. Below and above, walls of white blocked any further view, while whatever lay on the other side of the suns was obscured by dazzle and golden detail.

As it radiated through hundreds of miles of air, that light would fade and redden, or be shadowed by the countless clouds and objects comprising the nation of Aerie. If you traveled inward or up to civilized spaces, the light from other distant suns would begin to brighten before you ran out of light from yours; but if you went down or back, you would eventually reach a point where their light was completely obscured. There, a creeping chill took over. In the dark and cold, nothing grew. There began the volumes of Winter that made up much of the interior of the planet-sized balloon of air, called Virga, where Hayden lived.

Gavin Town hovered at the very edge of civilization, where the filtered light of distant fires could barely keep crops alive. It wasn't lonely out here, though; above, below, and all about hung the habitations of Man. Three miles up to the left, a farm caught the suns' light: within a net a hundred feet across, the farmer had gathered pulverized rock and soil, and was growing a crop of yellow canola. Each plant clutched its own little ball of mud and they all tumbled about slowly, catching and losing the light in one another's shadow. The highway that passed near the farm was busy, a dozen or more small cars sailing along guided by the rope that was the highway itself. The rope extended off into measureless distance, heading for the enemy's city, Rush. Below and to the right, a sphere of water the size of a house shimmered, its surface momentarily ridged by a passing breeze. Hayden could see a school of wetfish swirling inside the sphere like busy diamonds.

There was way too much to take in with a single glance, so Hayden almost didn't spot the commotion. Motion out of the corner of his eye alerted him; leaning over the railing and sighting left along the curving wall of the town, he saw an unusually dense tangle of contrails. The trails led back in the direction of the sun and as he watched, three gleaming shapes shot out of the cloud and arrowed in the same direction.

Strange.

Just as he was wondering what might be happening, the gravity bell rang again. Hayden pushed himself back from the rail and ran for the main street. It wouldn't do for somebody else to get the bikes running after he'd promised Miles he'd be there.

The stairwell to the gravity engines led off the center of the street. Gravity was a public service and the town fathers had insisted on making its utilities both visible and accessible to everyone. Consequently, Hayden was very surprised when he clattered down the steps into the cold and drafty engine room and found nobody there.

Bike Number Two still hung from its arm above the open hatchway in the floor. It wasn't a bike in the old gravity-bound sense; the fan-jet was a simple metal barrel, open at both ends, with a fan in one end and an alcohol burner at its center. You spun up the fan with a pair of pedals and then lit the burner, and you were away. Hayden's own bike lay partly disassembled in the corner. He'd been meaning to get it running tonight.

When started and lowered through the hatch, Bikes one and two would produce enough thrust to spin Gavin Town back up to a respectable five revolutions per minute. This had to be done once or twice a day so normally

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the engine room would have somebody in it either working, topping up the bike's tanks, or doing maintenance. Certainly if the gravity bell rang, somebody would always be here in seconds and the bike operational in under a minute.

The wind whistled through the angled walls of the room. Hayden heard no voices, no running feet.

After a few seconds, though, something else came echoing up through the floor. Somewhere within a mile or two, an irregular popping had started.

It was the unmistakable sound of rifle fire.

A cracking roar shook the engine room. Hayden dropped to his stomach to look out the floor hatch, just in time to see a bike shoot by just meters below. It flashed Slipstreamer gold. A second later another that gleamed Aerie green followed it. Then the town had curved up and away and there was nothing out there but empty sky. The firing continued, dulled now by the bulk of the town.

Now he heard pounding footsteps and shouting from overhead. Shots rang out from nearby, making Hayden jump. The volleys were erratic, undisciplined, while in the distance he heard a more even, measured response.

As he ran back up the steps something whistled past his ear and hit the wall with a *spang*. Splinters flew and Hayden ducked down to his hands and knees, knowing full well that it wouldn't do any good when this section of the town rotated into full view of whoever was firing. The bullets would come straight up through the decking.

He emerged onto the still-empty street and ran to the right, where he'd heard people firing. A narrow alley led to the town's other outer street. He skidded around the corner to face the braveway—and saw bodies.

Six men had taken up firing positions at the rail. All were now slumped there or sprawled on the planks, their rifles carelessly flung away. The wood of the rail and flooring was splintered in dozens of places. And for the first time in his life, Hayden saw blood.

Something glided into view beyond the railing, and he blinked at it in astonishment. The red and gold sails of a Slipstream warship spun majestically there, not two hundred yards below. Hayden could make out the figures of men moving inside the open hatches of the thing. Beyond it, partly eclipsed, lay another ship, and another. Contrails laced the air between and around them.

Hayden took a step toward the braveway and stopped. He looked at the bodies and at the warships, and took another step.

Something shot past the town and he heard a shout from the empty air outside. Gunshots sounded from below his feet and now a wavering contrail dissipated in the air not ten feet past the railing.

He ran to the braveway and took one of the rifles from the nerveless fingers of its former owner. He vaguely recognized the man as someone who'd visited the inn on occasion.

"What do you think you're doing?" Hayden whirled, to find Miles bearing down on him. The cook's mouth was set in a grim line. "If you poke your head out they're gonna shoot it off."

"But we have to do something!"

Miles shook his head. "It's too late for that. Take it from somebody who's been there. Nothing we can do now except get killed, or wait this out."

"But my mother's at the sun!"

Miles jammed his hands in his pockets and looked away. The sun was the Slipstreamers' target, of course. The secret project had been discovered. If Aerie could field its own sun, it would no longer be dependent on Slipstream for light and heat. Right now, Slipstream could choke out Aerie's agricul-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ture by shading their side of the sun; all the gains that Hayden's nation had made in recent years—admittedly the result of Slipstream patronage—would be lost. But the instant that his parents' sun came on the situation would change. Aerie's neighbors to the up and down, left and right would suddenly find a reason to switch allegiances. Aerie could never defend its sun by itself, but by building it out here, on the edge of darkness, they stood to open up huge volumes of barren air to settlement. That real estate would be a tremendous incentive to their neighbors to intercede. That, at least, had been the plan.

But if the sun were destroyed before it could even be proven to work . . . It didn't matter to Hayden, not right now. All he could think was that his mother was out there, probably at the focus of the attack.

"I'm the best flyer in town," Hayden pointed out. "These guys made good targets 'cause they weren't moving. Right now we need all the riflemen we can get in the air."

Miles shook his head. "Listen, kid," he said, "there's too many Slipstreamers out there to fight. You have to pick your battles. It ain't cowardice to do that. If you throw your life away now, you won't be there to help when the chance comes later on."

"Yeah," said Hayden as he backed away from the braveway.

"Drop the rifle," said Miles.

Hayden spun and raced down the alley, back to main street. Miles shouted and came after him.

Hayden clattered down the stairs to the engine room, but only realized as he got there that his bike was still in pieces all over the floor. He'd planned to roll it out the open hatch and fire it up when he was in the air. The spin of the town meant he would leave it at over a hundred miles an hour anyway; plenty of airflow to get the thing running, if it had been operable.

He was sitting astride the hoist that held Bike Number Two when Miles arrived. "What do you think you're doing? Get down!"

Glaring at him, Hayden made another attempt to pull the pins that held the engine to the hoist. "She needs me!"

"She needs you alive! And anyway, how are you gonna steer—"

The pin came loose, and the bike fell. Hayden barely kept his hold on it, and in doing so he dropped the rifle.

Wind burst around him, blinding him and taking his breath away. Fighting it, he managed to wrap his legs around the barrel-shape of the bike and used his own body as a fin to turn it so that the engine faced into the airstream. Then he grabbed the handlebars and hit the firing solenoid.

The engine caught under him and suddenly Hayden had a new sense of up and down: down was behind the bike, up ahead of it—and it was all he could do to dangle from its side as it accelerated straight into the nearby cloud.

His nose banged painfully against the bike's saddle. Icy mist roared down his body, threatening to strip his clothes away. A second later he was in clear air again. He squinted up over the nose of the jet, trying to get a sense of where he was.

Glittering arcs of crystal flickered in the light of rocket-trails: Aerie's new sun loomed dead ahead. Jet contrails had spun a thick web around the translucent sphere and its flanks were already holed in several places. Its delicate central machinery could not be replaced; those systems came from the principalities of Candesce, thousands of miles away, and used technologies that no one alive could replicate. Yet two Slipstream cruisers had stopped directly over the sun and were veiling themselves in smoke as they launched broadside after broadside into it.

Mother would have been topping up

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the fuel preparatory to evacuating her team. Nobody could enter the sun while it was running; you had to give it just enough fuel for its prescribed burn. The engineers had planned a two minute test for today, providing there was enough cloud to block the light in the direction of Slipstream.

A body tumbled past Hayden, red spheres of blood following it. He noticed abstractly that the man wore the now-banned, green uniform of Aerie. That was all he had time for, because any second now he was going to hit the sun himself.

Bike Number Two had never been designed to operate in open air. It was a heavy-duty fanjet, powerful enough to pull the whole town into a faster spin. It had handlebars because they were required by law, not because anybody had ever expected to use them. And it was quickly accelerating to a point where Hayden was going to be ripped off of it by the airstream.

He kicked out his legs, using them to turn his whole body in the pounding wind. That in turn ratcheted the handlebars a notch to the left; then another. Inside the bike, vanes turned in the exhaust stream. The bike began—slowly—to bank.

The flashing geodesics of the sun shot past close enough to touch. He had a momentary glimpse of faces, green uniforms and rifles, and then he looked up past the bike again and saw the formation of Slipstream jets even as he shot straight through them. A few belated shots followed him but he barely heard them over the roar of the engine.

And now dead ahead was another obstacle, a spindle-shaped battleship this time. Behind it was another bank of clouds, then the indigo depths of Winter that lurked beyond all civilization.

Hayden couldn't hold on any longer. That was all right, though, he realized. He made sure the jet was aimed directly at the battleship, then pulled up his legs and kicked away from it.

He spun in clear air, weightless again but traveling too fast to breathe the air that tore past his lips. As his vision darkened he turned and saw Bike Number Two impact the side of the battleship, crumpling its hull and spreading a mushroom of flame against the metal plates. He couldn't tell whether it had penetrated the ship's armor.

With the last of his strength Hayden went spread-eagled to maximize his wind resistance. The world disappeared in silvery gray as he punched his way into the cloud behind the battleship. A flock of surprised fish flapped away from his plummeting fall. He waited to freeze, lose consciousness from lack of air, or hit something.

None of that happened, though his fingers and toes were going numb as he gradually slowed. The problem now was that he was soon going to be stranded inside a cloud, where nobody could see him. With the din of the battle going on, nobody would hear him either. People had been known to die of thirst after being stranded in empty air. If he'd been thinking, he'd have brought a pair of flapper fins at least.

He was just realizing that anything like that would have been torn off his body by the airstream, when the cloud lit up like the inside of a flame.

He put a hand up and spun away from the light but it was everywhere, diffused through the whole cloud. In seconds a pulse of intense heat welled up and to Hayden's astonishment, the cloud simply vanished, rolling away like a finished dream.

The heat continued to mount. Hayden peered past his fingers, glimpsing a silhouetted shape between him and a blaze of impossible light. The Slipstream battleship was dissolving, the flames enfolding it too dim to be seen next to the light of Aerie's new sun.

Though he was slowing, Hayden

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

was still falling away from the battle. This fact saved his life, as everything else in the vicinity of the sun was immolated in the next few seconds. That wouldn't matter to his mother: she and all the other defenders were already dead, killed in the first seconds of the sun's new light. They must have lit the sun rather than let Slipstream have it as a prize.

The light reached a peak of agony and abruptly faded. Hayden had time to realize that the spherical blur flicking out of the orange afterglow was a shockwave, before it hit him like a wall.

As he blacked out he spun away into the blue-gray infinity of Winter, beyond all civilization or hope.

2

How miserable, how abandoned.

The feelings lit again as Lady Venera Fanning entered the tiled gallery separating her chambers from the offices of Slipstream's admiralty. The headache wasn't so bad today but her fingers still sought out the small scar on her jaw as she entered the echoing room. A lofty, pillared space, the hall ran almost the entire width of the palace townwheel; she couldn't avoid traversing it several times a day. Every time she did she relived the endless time after the bullet hit, when she'd lain here on the floor expecting to die. How miserable, how abandoned.

This was a cold place. The moaning of the wind from outside was the only sound except for her clicking footsteps, and that of the man behind her.

She would never enter the hall alone again. She knew it signaled weakness to everyone around her, but she needed to hear the servant's footsteps behind her here, even if she wouldn't look him in the eye and admit her feelings.

While that damnable hall brought back the memories whenever she entered it, Venera hadn't had the place demolished and replaced as her sisters would have. At least, she would not do that until the pain that radiated up her temples morning, noon, and night was ended. And the doctors merely exchanged their heavy-lidded glances whenever she demanded to know when that would be.

Venera flung back the double doors to the admiralty and was assailed by noise and the smells of tobacco, sweat, and leather. Right in the doorway four pages of mixed gender were rifling a file cabinet, their ceremonial swords thrust out and clashing in unconscious battle. Venera stepped adroitly around them and sidled past two red-faced officers who were bellowing at one another over a limp sheet of paper. She dodged a book trolley, its driver invisible behind the stacks of volumes teetering atop it, and in three more steps she entered the admiralty's antechamber, there to behold the bedlam of an office gearing up for war.

The antechamber was separated into two domains by a low wooden barrier. On the left was a waiting area, bare except for several armchairs reserved for elderly patrons. On the right, rows of polished wooden tables were manned by clerks who processed incoming reports. The clerks passed updates to a small army of pages engaged in rolling steep ladders up and down between the desks. They would periodically stop, crane their necks upwards, then one would clamber up a ladder to adjust the height or relative position of one of the models that hung like a frozen flock of fish over the clerks' heads. Two ship's captains and an admiral stood among the clerks, as immobile as if stranded by the hazard of the whizzing ladders.

Venera strolled up to the rail and rapped on it smartly. It took a while before she was noticed, but when she was, a page abandoned his ladder and raced over to bow.

"May I have the key to the lady's

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

lounge, please?" she asked. The page ducked his head and ran to a nearby cabinet, returning with a large and ornate key.

Venera smiled sweetly at him; the smile slipped as a pulse of agony shot up from her jaw to wrap around her eyes. Turning quickly, she stalked past the crowding couriers and down a rosewood-paneled corridor that led off the far side of the antechamber. At its end stood an oak door carved with bluejays and finches, heavily polished but its silver door-handle tarnished with disuse.

The servant made to follow her as she unlocked the door. "Do you mind?" she asked with a glower. He flushed a deep pink, and only now did Venera really notice him; he was quite young, and handsome. But, a servant.

She shut the door in his face and turned with her hands on her hips. "Well?" she said to the three men who awaited her, "what have you learned?"

"It seems you were right," said one. "Capper, show the mistress the photos."

The lounge's floors were smothered in deep crimson carpet, its walls of paneled oak so deeply varnished as to be almost black. There were no windows, only gaslights in peach-colored sconces here and there. While there were enough chairs and benches for a dozen ladies to wait in while others used the two privies, Venera had never encountered another here. It seemed she was the only wife in the admiralty who ever visited her husband at work.

The place smelled of blood. A high-backed chair had been dragged into the center of the room and in it a young man in flying leathers was now weakly rifling through an inner pocket of his jacket. His right leg was thickly bandaged, but blood was seeping through and dripping on the carpet, where it disappeared in the red pile.

"That looks like a main line you've cut there," said Venera with a professional narrowing of the eyes. The youth grinned weakly at her. The second man scowled as he tightened a tourniquet high on the flyer's thigh. The third man watched this all indifferently. He was a mild-looking fellow with a balding head and the slightly pursed lips of someone more used to facing down sheets of paper than other people. When he smiled at all, Venera knew, Lyle Carrier lifted his lips and eyebrows in a manner that suggested bewilderment more than humor. She had decided that this was because other people's emotions were meaningless abstractions to him.

Carrier was a deeply dangerous man. He was as close to a kindred spirit as she'd been able to find in this forsaken country. He was, in fact, the one man Venera could never completely trust. She liked that about him.

The young man hauled a sheaf of prints out of his jacket with a grimace. He held it up for Venera to take, his hand trembling as though it were lead weights he was handing her and not paper. Venera snatched up the pictures eagerly and held them to the light one by one.

"Ah . . ." The fifth photo was the one she'd been waiting to see. It showed a cloudy volume of air filled with spidery wooden dock armatures. Tied up to the docks was a row of stubby metal cylinders bristling with jets. Venera recognized the design: they were heavy cruisers, each bearing dozens of rocket ports and crewed by no less than three hundred men.

"They built the docks in a sargasso, just like you said," said the young spy. "The bottled air let me breathe on the way through. They're pumping oxygen to the work site using these big hoses . . ."

Venera nodded absently. "It was one of your colleagues who discovered that. He saw the pumps being installed outside the sargasso, and put two and two together." She riffled through rest

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

of the pictures to see if there was a better shot of the cruisers.

"Clearly another secret project," murmured Carrier with prim disapproval. "It seems nobody learned from the lesson we gave Aerie."

"That was eight years ago," said Venera as she held up a picture. "People forget . . . What's this?"

Capper jerked awake in his chair and with a visible effort, sat up to look. "Ah, that . . . I don't know."

The image showed a misty, dim silhouette partly obscured behind the wheel of a town. The gray spindle shape suggested a ship, but that was impossible: the thing dwarfed the town. Venera held the print up to her nose under one of the gaslights. Now she could see little dots scattered around the gray shape. "What are these specks?"

"Bikes," whispered the spy. "See the contrails?"

Now she did, and with that the picture seemed to open out for a second, like a window. Venera glimpsed a vast chamber of air, walled by cloud and full of dock complexes, towns, and ships. Lurking at its edge was a monstrous whale, a ship so big that it could swallow the pinwheels of Rush.

But it must be a trick of the light. "How big is this thing? Did you get a good look at it? How long were you there?"

"Not long . . ." The spy waved his hand indifferently. "Took another shot . . ."

"He's not going to last if I don't get him to the doctor," said the man who was tending the spy's leg. "He needs blood."

Venera found the other photo and held it up beside the first. They were almost identical, evidently taken seconds apart. The only difference was in the length of some of the contrails.

"It's not enough." Frustration made hot waves of pain radiate up from her jaw and she unconsciously snarled. Venera turned to find only Carrier looking at her; his face expressed nothing, as always. The leather-suited spy was unconscious and his attendant was looking worried.

"Get him out of here," she said, gesturing to the servant's door at the back of the lounge. "We'll need to get a full deposition from him later." Capper was roused enough to lean on the shoulder of his attendant and they staggered out of the room. Venera perched on one of the benches and scowled at Carrier.

"This dispute with the Pilot of Mavery is a distraction," she said. "It's intended to draw the bulk of our navy away from Rush. Then, these cruisers and that . . . thing, whatever it is, will invade from Falcon Formation. The Formation must have made a pact of some kind with Mavery."

Carrier nodded. "It seems likely. That is—it seems likely to me, my lady. The difficulty is going to be convincing your husband and the Pilot that the threat is real."

"I'll worry about my husband," she said. "But the Pilot . . . could be a problem."

"I will of course do whatever is in the best interest of the nation," said Carrier. Venera almost laughed.

"It won't come to that," she said. "All right. Go. I need to take these to my husband."

Carrier raised an eyebrow. "You're going to tell him about the organization?"

"It's time he knew we have extra resources," she said with a shrug. "But I have no intention of revealing our extent just yet . . . or that it's *my* organization. Nor will I be telling him about you."

Carrier bowed, and retreated to the servants' door. Venera remained standing in the center of the room for a long time after he left.

A thousand miles away, it would be night right now around her father's

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

sun. Doubtless the Pilot of Hale would be sleeping uneasily, as he always did under the wrought-iron canopy of his heavily guarded bed. His royal intuition told him that the governing principle of the world was conspiracy—his subjects were conspiring against him, their farm animals conspired against them, and even the very atoms of the air must have some plan or other. It was inconceivable to him that anyone should act from motives of true loyalty or love and he ran the country accordingly. He had raised his three daughters by this theory. Venera had fully expected that she would be disposed of by being married off to some inbred lout; at sixteen she had taken matters into her own hands and extorted a better match from her father. Her first attempt at blackmail had been wildly successful, and had netted her the man of her choice, a young admiral of powerful Slipstream. Of course, Slipstream was moving away from Hale, rapidly enough that by the time she consolidated her position here she would be no threat to the old man.

She hated it here in Rush, Slipstream's capital. The people were friendly, cordial, and blandly superior. Scheming was not in fashion. The young nobles insulted one another directly by pulling hat-feathers or making outrageous accusations in public. They fought their duels immediately, letting no insult fester for more than a day. Everything political was done in bright halls or council chambers and if there were darker entanglements in the shadows, she couldn't find them. Even now, with war approaching, the Pilot of Slipstream refused to beef up the secret service in any way.

It was intolerable. So Venera had taken it upon herself to correct the situation. These photos were the first concrete validation of her own deliberately cultivated paranoia.

She resolutely jammed the pictures into her belt purse—they stuck out conspicuously but who would look?—and left by the front door.

Her servant waited innocently a good yard from the door. Venera was instantly suspicious that he'd been peering through the keyhole. She shot him a nasty look. "I don't believe I've used you before."

"No, ma'am. I'm new."

"You've had a background check, I trust?"

"Yes, ma'am."

"Well, you're going to have another." She stalked back to the admiralty with him following silently.

Bedlam continued in the admiralty antechamber, but it all seemed a bit silly to her now—they were in a fever of anticipation over a tiny border dispute with Mavery, while farther out a much bigger threat loomed. Nobody liked migratory nations, least of all Slipstream. They should be ready for this sort of thing. They should be more professional.

A page jostled Venera and the photos fell out of her purse. She laid a back-handed slap across the boy's head and stooped to grab them—to find that her servant had already picked them up.

He glanced at two that he held, apparently by accident, then did a double-take. Venera wondered whether he'd tripped the page behind her back just so he could do this.

"Give me those!" She snatched them back, noting as she did that it was the mysterious photos of the great, dim gray object that he'd looked at. She decided on the spot to have him arrested on some sort of trumped-up charge as soon as she reached the Fanning estate.

Blazing with anger, Venera elbowed her way through the crowd of couriers and minor functionaries, and took a side way towards the stairs. Cold air wafted down from the stairs leading up to the cable-cars connecting the other towns in this quartet. Fury and

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

cold made her jaw flare with pain so that she wanted to turn and strike the insolent young man. With a great effort she restrained herself, and gradually calmed down. She was pleased at her own forbearance. *I can be a good person*, she reminded herself.

"Fifteen hundred feet," murmured the servant, almost inaudibly.

Venera whirled. He was trailing a few yards behind her, his expression distracted and wondering. "What did you say?" she hissed.

"That ship in the picture . . . was fifteen hundred feet long," he said, looking apologetic.

"How do you know that? Tell me!"

"By the contrails, ma'am."

She stared at him for a few seconds. The man was either far more cunning than she'd given him credit for, or he was an idiot.

Or, she reluctantly admitted to herself, maybe he really had no idea that she'd met with someone in the lady's room, and didn't expect a lady like herself to be carrying sensitive information. In which case the photos, to him, were just photos.

"Show me." She fished out the two shots of the behemoth and handed them to him.

Now he looked doubtful. "I can't be sure."

"Just show me how you reached that conclusion!"

He pointed to the first picture. "You see in the near space here, there's a bike passing. That's a standard Grey 45, and it's running at optimum speed, which is a hundred twenty-five knots. See the shape of its contrail? It only gets that feathered look under optimum burn. It's passing close by the docks so you can tell . . ." he flipped to the second picture, "that here it's gone about six hundred feet, if that dock is the size it looks to be. The means the second picture was taken about two seconds after the first.

"Now look at the contrails around the big ship. Lady, I can't see any bikes that *aren't* Grey 45s in the picture. So if we assume that the ones in the distance are Greys too, and that they're going at optimum speed, then these ones skimming the surface of the big ship have traveled a little less than half its length since the first picture. That makes it a bit over twelve hundred feet long."

"Mother of Virga." Venera stared at the picture, then at him. She noticed now that he was missing the tips of several fingers: frostbite, in all likelihood. And his young face was red and wind-burned, except around the eyes.

She took back the pictures. "You're a flyer."

"Yes, ma'am."

"Then what are you doing working as a body servant in my household?"

"Flying bikes is a dead-end career," he said with a shrug.

They resumed walking. Venera was mulling things over. As they reached the broad clattering galleries of the cable car station, she nodded sharply and said, "Don't tell anybody about these, if you value your job. They're sensitive."

"Yes, ma'am." He looked past her. "Uh-oh."

Venera followed his gaze, and frowned. The long cable car gallery was full of people, all of whom were crowding in a grumbling mass under the rusty cable stays and iron-work beams of the town that formed the chamber's ceiling. Six green cable cars hung swaying and empty in the midst of the throng. "What's the hold-up?" she demanded of a nearby naval officer.

"Cable snapped," he said with a sigh. "Wind shear pulled the towns apart and the springs couldn't compensate."

"Don't drown me in details. When will it be fixed?"

"You'd have to ask the cable monkeys, and they're all out there now."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"I have to get to the palace!"

"I'm sure the monkeys sympathize, ma'am."

She was about to erupt in a tirade against the man, when the servant touched her arm. "This way," he murmured.

With a furious *hmmph*, Venera followed him out of the crowd. He was heading for an innocuous side entrance. "What's down there?" she asked.

"Bike berths," he said as he opened the door to another windy gallery. This one was nearly empty. It curved up and out of sight, its right wall full of small offices with frosted-glass doors, its left wall opening out in a series of floor-to-ceiling arched windows. Beyond the windows was a braveway and then open turning air.

The gallery floor was full of hatches. About half of them had bikes suspended over them. The place smelled of engine oil, a masculine smell Venera found simultaneously rank and intriguing. Men in coveralls were rebuilding a bike nearby. Its parts were laid out in a neat line across a tarpaulin, their clean order betraying the apparent chaos of the opened chassis.

She was in a place of men; she liked that. "You have your own bike?" she asked the servant.

"Yes. It's right over there." He took a chit to the dock master and traded it in for a key and a worn leather jacket. They went over to the bike and he knelt to unlock the hatch beneath the gently swaying bike.

"Let me guess," she said. "A Grey 45?"

He laughed. "Those are workhaulers. This is a racer. It's a Canfield Arrow, Model 14. I bought it with my first paycheck from your household."

"There's a passenger seat," she said, suddenly thrilled at the prospect of riding the thing.

He squinted at her. "Have you never flown a bike, Lady?"

"No. Does that surprise you?"

"I guess it's always been nice covered taxis for you," he said with a shrug. "Makes sense." He winched open the hatch and she took an apprehensive step back. Venera had no fear of the open air; it was speed that frightened her. Right now the air below the hatch was whipping by at gale force.

"We'll get blown off!"

He shook his head. "The dock master's lowering a shield ahead of the hatch. It'll give us several seconds of slipstream to cruise in. Just hunker down behind me—the windscreen's big—and you'll be fine. Besides, I won't take us flat out; too dangerous inside city limits."

He straddled the bike and held out his hand. Venera suppressed her grin until she was seated behind him. There were foot straps, but she had nothing to hold onto with her hands except him. She wrapped her arms tightly around his waist.

He pushed the starter and she felt the engine rumble into life beneath her. Then he said, "All set?" and reached up to unclip the winch.

They fell into the air and for a few seconds the curve of the town's undersurface formed a ceiling. There was the shield, a long tongue of metal hanging down but pulling up quickly. "Head down!" he shouted and she buried her face in his back. Then the engine was roaring to drown all thought, the vibration rattling up through her spine, and they were free in the air between the city cylinders. The wind wasn't tearing her from this man's grasp, so Venera cautiously leaned back and looked around. She gave an involuntary gasp of delight.

Contrails like spikes and ropes stood still in the air around them. Tethers with gay flags on them slung here and there, and everywhere taxies, winged humans, and other bikes shot through the air. The quartet of towns that in-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

cluded the admiralty was already receding behind them; she turned to look back and saw that the cable-car system, whose independent loop touched the axle of the vast spinning cylinder, was indeed slack. Men floated in open air around the break, their tools arrayed in constellations about them as they argued over what to do. Venera turned forward again, laughing giddily at the sensation of power that pulled her up and up towards the next quartet.

They passed heavy steel cables and then the broad cross-shaped spokes of a town's pinwheel. Up close the brightly colored sails were torn and patched. In far too little time the bike was rising under another town, the long slot of a jet entrance visible overhead. Venera's flyer expertly inched them into a perfect tangent course, and it seemed as if the town's curving underside simply reached out and settled around them. Her flyer shut down the engine and held up a hook, clipping it to an overhead cable just as they began to fall again. And there they were, hanging in a gallery almost identical to the one they just left. A palace footman ran up and began winching them away from the slot. They had arrived.

Venera dismounted and staggered back a few steps. Her legs had turned to jelly. Her servant swung off the back of the bike as though nothing had just happened. He grinned happily at her. "It's a good beast," he said.

"Well." She cast about for something to say. "I'm glad we're paying you enough that you can afford it."

"Oh, I never said I could afford it."

She frowned, and led the way out of the gallery. From here she knew the stairs and corridors to take to reach Slipstream's strategic command office. Her husband, Admiral Fanning, was tied up in meetings there, but he would see her, she knew. She thought about how much she would tell him regarding her spy network. As little as possible, she decided.

At the entrance to the office she turned and looked frankly at the servant. "This is as far as you can go. Wait down at the docks—you can run me back home the same way you brought me."

He looked disappointed. "Yes, ma'am."

"Hmm. What's your name, anyway?"

"Griffin, ma'am. Hayden Griffin."

"All right. Remember what I said, Griffin. Don't talk about the photos to anyone." She waggled a finger at him, but even though her head was pounding, she couldn't summon any anger at the moment. She turned and gestured for the armed palace guard to open the giant teak doors.

As she walked away she thought of the beautiful freedom Griffin must have in those moments when he flew alone. She'd caught a glimpse of it when she rode with him. But entangled as she was in a life of obligation and conspiracy, it could never be hers.

How miserable. How abandoned.

Hayden watched her go in frustration. So close! He'd gotten to within a few yards of his target today. And then to be thwarted at the very entrance to the command center. He eyed the palace guard, but he knew he couldn't take the man and the guard was eyeing him back. Reluctantly, Hayden turned and headed back towards the docks.

He'd nearly blown it picking up those pictures. Obviously he'd underestimated Lady Fanning. He wouldn't do it again. But since he had been assigned to her, he hadn't been able to get anywhere near Fanning himself. If she liked him, though . . .

It was only a matter of time, he decided. Admiral Fanning would come within arm's reach one day soon.

And then Hayden would kill him.

3

A flock of fish had wandered into

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the airspace inside Quartet One, Cylinder Two. Disoriented by the city lights spinning around them and caught in the cyclone of air that Rush's rooftops swept up, they foundered lower and lower in a quickening spiral, until with fatal suddenness they shot between the eaves of two close-leaning, gargoyle-coigned apartments. They banged off window and ledge, flagpole and fire escape, to end flapping and dying in a narrow street along which they'd scattered like a blast of buckshot.

Hayden ignored the cheering locals who ran out to scoop up the unexpected windfall. He paced on through the darkened alleys of Rush's night market, noticing nothing, but instinctively avoiding the grifters and thieves who also drifted through the crowds of out-country rubes. He felt slightly nauseous, and twitched at every loud laugh or thud of crate on cement.

The market was stuffed into a warren of small streets. Hayden loved walking through the mobs; even after living here for two years, the very fact that the city comprised more than one cylinder amazed him. The rusting wheels of the city provided gravity for over thirty thousand souls. Throw in the many outlying towns and countless estates that hung in the nearby air like sprays of tossed seed, and the population must push a hundred thousand. The anonymity this afforded was a heady experience for an unhappy young man. Hayden could be with people yet aloof and he liked it this way.

He was dead tired after another long day at the Fanning estate; but if he went back to the boarding house now, he would just pace until his downstairs neighbors complained. He would pull at his hair, and mutter to himself as if he were mad. He didn't want to do that.

It was all stress, of course—a result of spending his days so close to his goal. He walked through the Fanning household like a dutiful servant for hours while his mind raced through scenarios: Fanning walking by distracted in a hallway; Hayden slipping into the admiralty unnoticed by the omnipresent security police . . . It was all useless. He was paralyzed by indecision and he knew it. But he would be patient, and his chance would come.

He paused to buy a sticky bun at a vendor he favored, and continued on down a twisting run sided with fading clapboard. Slipstream's sun was on its maintenance cycle, and darkness and chill had settled over the city. Here and there in the alleys, homeless people kept barrel fires going and charged a penny or two to anyone who stopped to warm their hands. Hayden sometimes stopped to talk to these men, whose faces he knew only as red sketches lit from below. They could be valuable sources of information, but he never revealed anything about himself to them, least of all his name.

He'd driven Venera Fanning again today—unnecessarily, for she could easily have taken a cable car. He wondered at her motives in riding with him. When he'd returned to his room he'd discovered that a faint scent of her perfume still hovered on his jacket. It was alluring, as she was with her porcelain complexion—marred only by the scar on her chin—and her hair the color of Winter skies. Attractive she might be, but she was also without doubt the most callous human being he'd ever met. And she traded on her beauty.

Considering his lonely existence and his reasons for being here, it was painfully ironic to think that she was the first woman he'd given a ride to since arriving in Rush.

Halfway down the alley was a cul de sac. A knife seller had set up his table across its entrance, and had mounted targets on the blank wall at the dead end. Hayden stopped to balance a sleek dart knife on his finger. He held it

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

out facing away from him, then at right angles to that.

"It's good in all the directions of gravity," said the vendor, who in this light was visible only as a black cut-out shape with a swath of distant lamplight revealing his beige shirt collar. The black silhouette of an arm rose in an indistinct gesture. "Try it out."

Hayden balanced the knife for a second more, then flipped it and caught it behind the guard fins. He threw it with a single twitch of his wrist and it buried itself in the center of a target with a satisfying *thump*. The vendor murmured appreciatively.

"That's not our best, you know," he said as he waddled back to retrieve the knife. His mottled hand momentarily became visible as he pulled the knife from the wall. "Try this." Back at the table, he fished in a case and drew out a long arrow-shape. Hayden took it from him and turned it over with a professional eye. Triangular cross-section to the blade, guards that doubled as fins for throwing, and a long tang behind that with another fin on its end. Its heft was definitely better than the last one.

He thought of Admiral Fanning, who had led the attack on Aerie's secret sun and blew Gavin Town to smithereens on the way by. Without even thinking he spun and let fly the knife. It sank dead center in the smallest target.

"Son, you should be in the circus," said the vendor. Hayden heard the admiration in his voice, but it didn't matter. "Say, do you want to hang around a while and throw for the crowd? Could bring in some business."

Hayden shook his head. He wasn't supposed to have skills like knife throwing. "Just dumb luck," he said. "I guess your knives are just so good that even an idiot can hit the bulls-eye with one." Ducking his head and aware of the lameness of his excuse, he backed away and then paced hurriedly down the alley.

"That wasn't smart," said a shadow at his elbow.

Hayden shrugged and kept going. "What's it to you?"

The other fell into step beside him. Hayden glimpsed a tall, rangy figure in the dim light. "Somebody you owe a favor, Hayden."

He stepped away involuntarily. "Who the—"

The man in the shadows laughed and moved into a pale lozenge of candle light that squeezed out between the cracks of a low window. He presented his profile to Hayden. "Don'tcha recognize me, Hayden? Last time I saw you, you were dropping out of Gavin Town on a runaway bike!"

"Miles?" Hayden just stood there, painfully aware of how meetings like this were supposed to go: the prodigal and the old soldier, laughing and slapping each other's backs in surprise and delight. They would head for a bar or something, and regale each other with stories of their exploits, only to stagger out again singing at three the next morning. Or so it went. But he'd never much liked Miles, and what did it matter, really, to find out now that one other person had survived the attack on the sun? It didn't change anything.

"What are you doing here?" he asked after the silence between them had stretched too long.

"Looking after you, boy," said the ex-soldier. "You're not happy to see me?"

"It's not that," he said with a shrug. "It's . . . been a long time."

"Well, long or not, I'm here now. What do you say?"

"It's . . . good to see you."

Miles laughed humorlessly. "Right. But you'll be thanking me before long, believe me." He started walking. "Come on. We need to find a place to talk."

Here it came, thought Hayden: the bar, the war stories, the laughing. He hesitated, and Miles sighed heavily. "Kid, what if I told you that I'd saved

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

your ass today? That if it weren't for me, you'd be on your way out of Rush by now with a permanent deport order issued against you?"

"I don't believe you."

"Suit yourself." Miles started walking. After a moment Hayden ran after him.

"What do you mean?" he asked.

"'It's so good to see you, Miles. How are you doing, Miles? How did you survive Gavin Town?'" The ex-soldier glared at Hayden as they crossed a busy and well-lit thoroughfare. "Jeez, you were always a surly little runt, but let me tell you, I'm wondering whether I should have bothered faking the docs for your background check."

"Background check? What background check?" He'd had two of them already, he knew, a cursory one when he first applied for Rush residency, and a more thorough check after he answered the call for work at the Fanning residence. It seemed all too plausible that somebody somewhere should want to do more digging—and now he realized who. "Venera Fanning. She had me investigated."

"But not by the legal authorities," said Miles as he ducked into another alley. This one was empty, and meandered in the general direction of one of the town spokes. The spoke jabbed into the heavens above all rooftops, a tessellation of wrought-iron girders barnacled here and there by shanty huts built by desperate homeless people. Some spokes had municipal elevators in them and were quite well-kept; this one was a rusty derelict unlit from any source.

"It's just lucky we have a man in Fanning's network." Miles had disappeared in the darkness ahead. Hayden followed his voice, idly wondering if he'd been lured in here to be mugged. "This time they weren't going to just hold your papers up to a light and check the birth registries. Friends, family, co-workers—I had to come up with them all at the last minute."

"But how did you know about it?"

"Ah, finally the lad asks a sensible question. Here, watch your step." They had reached the gnarled fist of beam and cable that was the spoke's base. Someone had built a crude set of stairs by simply jamming boards into the diamond-shaped gaps in the ironwork. Miles plodded up this, wood bending and twanging under his feet.

His voice drifted down from overhead. "I review intercepted dispatches about security checks. It's my job in the Resistance."

Hayden raced up the steps after him. "Resistance? It still exists?"

"Hell, Hayden, if you hadn't pulled a disappearing act after Gavin Town got hit, you'd still be in it. You were born into the Resistance—you were the first baby born of two members, did you know that? We searched for you for days after the attack . . ."

"I didn't know. I fell into Winter." He looked down, abstractly thinking how interesting the rooftops looked from just overhead, with their shingled peaks and streamlined eaves. From here you could see the whole circular geometry of the town, its mazes of close-packed buildings, streetlights glowing overhead and on two sides, while the permanent winds of Slipstream whistled from the dark open circles of night to left and right. A gust shook him and he realized that he'd fall hard enough to be killed if he got blown off this precarious vantage point, so Hayden clutched the stanchions more tightly and groped for the next ladder-like step with his free hand. He was starting to weigh less already; they must be a hundred meters in the air by now. "Miles, where are we going?"

"There." The former cook pointed straight up. The inside of the openwork spoke was blocked by a wood ceiling ten feet further up. The surface was white with strange, broad black

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

bands painted across it. With a start Hayden realized they were intended to look like shadows; this box was supposed to be invisible if looked at from some particular perspective—probably from the direction of the Office of Public Infrastructure.

Miles ascended the last distance by ladder and raising his fist, knocked it against wood. A square of light appeared above his head, and he clambered up. "Come on in, Hayden."

He cautiously raised his head above the lip of the trapdoor, and then, for the first time in many years, he entered a cell of the Resistance.

When Hayden was twelve, his parents had taken him on his first visit to Rush. He had complained, because lately he'd come to know that though Slipstream was a great nation, it was not *his* nation. His friends had jeered at him for visiting the camp of the enemy, though he didn't exactly know why Slipstreamers were bad, or what it meant to be a citizen of Aerie instead.

"That's why we're going," his father had said. "So that you can understand."

"That, and to see what they're wearing in the principalities," said Mother with a grin. Father had glowered at her, but she ignored him.

"You'll love it," she said. "We'll bring back stuff to make those pals of yours completely envious."

He'd liked that thought; still, Father's words had stuck with him. He was going to Rush to *understand*.

And he thought he did understand, the moment that their ship had broached the final wall of cloud and he glimpsed the city for the first time. As light welled up, Hayden flew to a stoutly-barred window with some other kids—there was no centrifuge in this little ship, so everybody was weightless—and shielded his eyes to look at their destination.

The nearby air was full of travelers, some riding bikes, some on prop-driven contraptions powered by pedals, and some kicking their feet to flap huge white wings affixed to their backs. They carried parcels, towed cargos, and in the case of the fan-jets, left behind slowly-fading arcs and lines of white contrail to thatch the sky.

Their cylindrical frigate had emerged from the clouds near Slipstream's sun, which made an inferno of half the sky. Seconds out of the mist and the temperature was already rising in the normally-chilly ship's lounge. The other boys were pointing at something and shouting excitedly; Hayden peered in that direction, trying to make out what was casting a seemingly impossible shadow across an entire half of the view. The vast shape was irregular like any of the rocks they had passed on their way here. Where those rocks were usually house-sized and sprouted spidery trees in all directions, this shape was blued with distance and covered with an even carpet of green. It took Hayden a few seconds to realize that it really was a rock, but one that was several miles in diameter.

He gaped at it. Father laughed from the dining basket, woven of wicker, where he perched with Mother. "That's the biggest thing you've ever seen, Hayden. But listen, there's much bigger places. Slipstream is not a major state. Remember that."

"Is that Rush?" Hayden pointed.

Father pulled himself out of the basket and came over. He bulked much bigger than the kids, who made a place for him next to Hayden. "The asteroid? That's not Rush. It's the source of Slipstream's wealth, though—it and their sun." He leaned on the rail and pointed. "No. *That* is Rush."

Maybe it was because he'd never seen anything like it before, but the city simply hadn't registered in Hayden's mind until that moment. After all, the wheels of Aerie were seldom more than two hundred yards across, and were simply wheels made of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

wooden planks lashed together and spoked with rope. You spun up the whole assembly and built houses on the inside surface of the wheel. Simple. And never had he seen more than five or six such wheels in one place.

The dozens of towns that made up Rush gleamed of highly polished metal. They were more cylindrical than ring-shaped, and none was less than five hundred yards in diameter. The most amazing thing was that they were tethered to the forested asteroid in quartets like mobiles; and radiating from each cylinder's outer rim were bright sails of gold and red that transformed them from mere towns into gorgeous pinwheels.

"The asteroid's too big to be affected by the wind," said Father. "The towns are not. They use the sails to keep the wheels spun up." This made sense to Hayden, because wind was the result of your moving at a different speed than whatever airmass you were in. Most of the time, objects migrated outward and inward in Virga to the rhythm of slowly circulating rivers of air. You normally only experienced wind at the walls of a town or while flying. Many times, he had folded little propellers of paper and let them out of a braveway on strings. They'd twirled in the rushing air. So did the towns of Rush, only much more slowly.

Hayden frowned. "If that big rock isn't moving with the air, won't it drift away from the rest of Slipstream?"

"You've hit on the very problem," said Father with a smile. "Slipstream's more migratory than most countries. The Slipstreamers have to follow their asteroid's orbit within Virga. You can't see from here, but their sun is also tethered to the asteroid. Ten years ago, Slipstream drifted right into Aerie. Before that, we were a smaller and less wealthy nation, being far from the major suns. But we were proud. We controlled our own destiny. Now what are we? Nothing but vassals of Rush."

Hayden barely heard him. He was eagerly staring at the cities.

Their ship arrived at mid-day to find a traffic jam at the axis of one of the biggest cylinders. It took an hour to disembark, but Hayden didn't care. He spent the time watching the heavily built-up inner surface of the town revolve past. He was looking for places to visit. From the axis of the cylinder, where the docks sat like a jumble of big wooden dice, cable-ways radiated away to the other towns that made up the city. One wheel in particular caught his eye—a huge cylinder whose inside seemed to be one single building with balconies, coigns, and glittering glass-paneled windows festooning it. This cylinder was surrounded by warships, which Hayden had seen in photos but never been close to before. The massive wooden vessels bristled with cannon ports, and they trailed smoke and ropes and masts like the spines of fish. They were majestic and fascinating.

"You'll never get *there*," said Father drily. "That's the Pilot's palace."

After ages, they were finally able to descend the long, curving, covered stairway to the street. Here Hayden had to endure another interminable wait while a man in a uniform examined Father's papers. Hayden was too distracted at the time to really notice his father's falsely jovial manner, or the way his shoulders had slumped with relief when they were finally accepted into the city. But after some walking he turned to Mother and kissed her, saying quietly, "I'll be back soon. Check us into the hotel, but don't wait for me. Go and do some shopping, it'll take your mind off it."

"Where's he going?" Hayden watched as Father disappeared into the crowd.

"It's just business," she said, but she sounded unhappy.

Hayden quickly forgot any misgivings this exchange might have raised.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The town was huge and fascinating. Even the gravity felt different—a slower turn-over of the inner ear—and there were points where you couldn't see the edges of the place at all. He followed his mother around to various outlets and while she haggled over wholesale paper prices for the newspaper she helped run, Hayden was happy to stare out the shop's windows at the passing crowds.

Gradually, though, he did begin to notice something. The people here dressed differently than people back home. They also had a distinct accent. And though the shop-keepers weren't actually hostile to Mother, they weren't very friendly either. Neither were the other kids he saw in the street. He smiled at one or two, but they just turned away.

He could have forgotten these details if not for what happened next. As they approached the hotel late that afternoon—Hayden laden with packages, his mother humming happily—he spotted Father at the hotel entrance, standing with his hands behind his back. Hayden felt his mother clutch his shoulder even as he waved and shouted a hello. It was only then that he noticed the men standing with his father, men in uniform who turned as one at the sound of Hayden's voice.

"Shit," whispered Mother as the policemen converged on her and a very confused Hayden.

The rest of the trip mostly consisted of waiting in various pale-green, bare rooms with his mother, who mostly sat white-faced and silent, not answering any of Hayden's increasingly petulant questions. They didn't go back to the hotel to sleep, but were given a couple of rough cots in a small room in the back of the police station. "Not a cell," said the sergeant who showed them to it. "A courtesy apartment for relatives."

Father had reappeared the next day. He was disheveled, subdued, and had a bruise on his cheek. Mother wept in his arms while Hayden stood nearby, hugging his own chest in confused anger. Later that day they boarded a passenger ship considerably less posh than the one they had arrived on, and Hayden watched the bright pinwheels of Rush recede in the distance, unexplored.

Later Father had explained about the Resistance and the importance of assembling the talent and resources Aerie needed to strike out on its own. Hayden thought he understood, but what mattered was not the politics of it; it was the memory of walking through Rush's crowded streets next to his father, whose hands were bound behind his back.

"No, it's not our headquarters," said Miles as Hayden looked around the little room. "Just a watching-post. We're at a rare spot that lets us look down the window of the semaphore-room in the admiralty. But we also store sensitive materials here—like guns." He gestured to a stack of long boxes on the floor.

The place was little more than ten feet on a side, though a ladder led up to what was presumably a second level. Blackout curtains covered three walls. A little chair in the out-of-fashion Lace style perched in front of a desk where a man with thick glasses and a halo of white hair sat muttering over a pile of paper. In the opposite corner crouched a lanky man dressed entirely in black. He was walking his fingers over a map of Rush, evidently trying to gauge distances in one of the cylinders.

"Lads, meet Hayden Griffin. He's the son of the original sunlighters."

The man in black just grunted; but the balding fellow at the table sat up straight and cranked his glasses down to get a look at Hayden. "Grace! So it is! You probably wouldn't remember me, Hayden, but I baby-sat for you when you were four."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Martin Shambles," said Miles. "And this one, he's V.I.P. Billy. Our assassin."

Hayden nodded to them both, trying not to sneak another look at Billy. Shambles stood up and held out his hand. "Well met, Hayden! Looks like we saved your ass today."

"I wasn't aware it needed saving," said Hayden. But he shook the offered hand.

"'Course, it would have been easier if we'd known you were still alive." Shambles sat back down, chuckling. "And working in the Fanning house, no less! That caused a stir. Some of our boys went so far as to claim you'd turned, gone over to their side—"

"But we know you wouldn't do that, would you?" asked V.I.P. Billy, who was now standing. Hayden suddenly realized that he was unfavorably placed with his back to a corner, with Miles and Billy on either side of him.

"Of course, there's the question of where you've actually been the past several years," continued Shambles, who was unconcernedly peering at his papers again. "We had a back story ready for somebody else, papers, friends—it's the sort of in-depth investigation Venera Fanning goes in for. She's much more thorough than the admiralty that way. I mean, we traced you as far as we could, but that wasn't far. Not far at all, in fact."

Despite the cold air, Hayden was starting to sweat. "But—but I could ask you the same thing," he said. "Where were you? When the sun blew up and I fell into Winter, where were you? It wasn't the Resistance who found me and nursed me back from frostbite. Hell, I fell *four hundred miles* before I finally hit a mushroom farm run by this weird old couple . . . Nobody came after me. Did you even look?"

Miles nodded gravely. "We looked. Your falling into Winter was one possibility. Being captured by one of Fanning's ships was another. It was fifty-fifty which had happened."

"These people . . ." Hayden had trouble thinking of what to say. He knew his life was on the line here. "They were exiles. A man and woman named Katcheran. Said Aerie had kicked them out twenty years ago. They had no gravity, they were as fragile as birds. They grew mushrooms on this little rock they'd found in the emptiness, and occasionally they'd jet over to the outskirts of Aerie to drop some off for supplies. But it took them ages to ferment enough alcohol for fuel . . . he tended to drink it away."

Miles looked skeptical, but Shambles perked up. "Did you say Katcheran?" Hayden nodded. Shambles pursed his lips. "Haven't heard that name in years." He tilted his head to one side and looked at Hayden shrewdly. "Go on."

Hayden did his best to describe his stay in the dark regions outside civilization. The volumes of air there were vast, and not all of it was cold, or dark. The little mushroom farm was just a cave to live in hollowed out of a clay ball no more than fifty feet in diameter. Katcheran and his wife bickered in a constant, monotonous murmur. Hayden had spent most of his time outside, watching the skies for any sign of a passing ship.

The distant beacons of Aerie teased him whenever he looked in its direction. But every now and then dawn would come as clouds parted around some distant sun. Then he could see just how far away from home he'd come. Hazy depths of emptiness opened out to all sides, not even a stray boulder or water ball visible for miles upon miles. He was stranded in a desert of air, and a few times he'd curled into a ball, hovering above the stinking fungus, and wept.

On two or three occasions, though, he saw more. The shells of cloud that enveloped the center of Virga sometimes parted, revealing the Sun of Suns, Candesce. Daylight would sud-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

denly flash out to fill the entire volume of Winter. Each time, Hayden had stood on the air, amazed at the brilliance of it—at the sheer size of an ancient, untended fusion engine that put all other suns in Virga to shame. Dozens of civilizations depended on that single central light, he'd heard. It was the greatest source of heat in the world; it drove the circulation cells in which Aerie and the other nations migrated slowly inwards and outwards.

The core components of his parents' sun had come from Candesce; the sun of suns was the wellspring for all of Virga's lesser lights.

"It was a year before Katcheran had enough fuel for us to fly back, and then he followed the beacons he knew, which brought us in a hundred miles away from Gavin Town. Of course, the town was a legend by then, but nobody knew much about it. Any pieces that were left after Slipstream attacked had been dismantled or drifted away. I didn't have anybody to go to . . . any way to get in touch with the Resistance, unless I came to Rush, and I didn't have any money to travel. I got a job in a kitchen in Port Freeley and saved until I could get passage here. But I never heard anyone talk about the Resistance, much less tell me how to find it again."

Miles nodded, but Billy looked unconvinced. "But why are you working for the Fannings? It took you a lot of effort to do it—you even forged your Slipstream citizenship yourself, by the looks of it."

Hayden stared at him. "Well, why do you think I came here? I came to kill Admiral Fanning."

There was a brief silence while the other three looked at one another. Then Billy cracked a slight smile. "You expect us to believe that?"

"He killed my family!" Hayden didn't care that the man in black was a killer. The indignity of having his motives suspected was too just too much. "They blew up our sun! I care about that! Don't you care? What have you been doing here, all these years? What kind of a Resistance is this? You're supposed to be an assassin, why haven't you killed him?" He stepped over to Shambles' table and tossed some of the papers in the air. "What, are you gonna *plan* them all to death? Is that the idea? Well, while you've been squatting on your asses in your little box, I've been doing something with my time. I was ten feet away from him today; tomorrow I'll be right there, and then he'll be dead."

He glared at them. "That's why I came here. That's what I'm doing. So what are you doing?"

Shambles adjusted his glasses and patted down the papers. "Well, Hayden my lad, we're trying to save our country. That would seem like a very different goal from yours, now wouldn't it?"

"Oh, please," said Hayden, crossing his arms. "What's to save? Slipstream annexed Aerie ages ago. I don't even *remember* how it was before that happened. It's ancient history."

"What you say is very true," said Shambles with a thoughtful nod. "However, it is also true that, since Slipstream is a migratory nation, it will someday migrate its way out of Aerie. Our concern is with what happens when that occurs."

Hayden looked at him blankly.

"Hmm." Shambles turned in his chair, crossing his legs. "It is a fact of youth that it has no concept of the future. Yet that is what we are here to discuss. The future of Aerie—and your future."

Hayden snorted.

"Tell me," said Shambles, "what is it, fundamentally, that keeps a nation together?"

Hayden decided to take the bait. "A sun."

Shambles shook his head. "No. It's *formation flying*. That is what keeps a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

nation together. If all your towns and farms and water balls are sailing off in different directions, it hardly matters if you've got a sun of your own, does it? What's essential is that you keep everybody flying on the same heading, maintaining the same altitude and position above the Sun of Suns. Aerie is still doing that—for now. The danger is that the presence of the Slipstream sun in our skies will cause parts of the nation to drift away, leave the formation, and join other countries. Hayden, that is a threat far greater than any police actions or propaganda by Slipstream could be."

"For ten years now we've been keeping Aerie in formation," said Miles. "That's what the Resistance does. What possible good would revenge do us? If you kill Fanning, he'll just be replaced."

"Yes," said Hayden, "but he'll also be dead."

Miles sighed. "I brought you here tonight because I hoped we could bring you back into the net. With your position in the Fanning household, you could be invaluable to us—especially now that Slipstream's finally drifted close enough to our neighbors that it's been perceived as a threat. Mavery is moving against Slipstream. Slipstream will edge into Mavery territory in a year or two and at that point they'll find themselves fighting a two-front war, against Mavery and us. Our job is to prepare for that, and to make sure that when the time comes, we either win or convince them to commit all their forces to Mavery, and leave us behind. If we had a spy in the very heart of the admiralty . . ." His expression was greedy.

"Aerie is gone," Hayden said. "When Slipstream leaves they'll take their sun with them. Without a sun, Aerie will freeze in the dark. The people will leave. I've lived in Winter. I know what it's like."

He shook his head. "I'm only here to do one thing. And after that . . . I don't care."

"But, Hayden my boy," purred Billy as he put an arm around Hayden's shoulder, "the problem is, we care. It's a worry, you know—the vision of you shooting Fanning and then being caught and tortured. You might talk about us, you see."

"Oh! No, I—"

"Now it would be supremely gauche of me to threaten your life at this point," Billy went on. "After all, as you say, you have your own path to take. That's fine. But if you're not going to join us, then we have one simple request."

"What's that?"

"If you're going to kill Fanning up close and personal like, say in the middle of the admiralty itself . . . Just make sure you kill yourself too, hmm? As a favor to us, you see."

Hayden bolted to the trapdoor and flung it up. "You know where to find us if you change your mind," Shambles called cheerfully.

"You won't hear from me," snapped Hayden as he lowered himself down to the invisible ladder. Slamming the trapdoor, he began clumsily backing his way back down to the city, fuming and muttering as he went.

He was just above the rooftops when a lurid orange flash lit up the sky. A distant grumble like thunder reached his ears. Hayden paused, clinging to the swaying planks, and listened.

The tearing sound of a jet could be heard fading in the distance. Then another one, growing closer. Funny; he knew all about bikes, but he couldn't identify the type from this one's sound.

Then something flashed by outside the iron stanchions. He poked his head out between the girders in time to see something bright shoot straight into the lit window of a mansion near the far end of the cylinder. To his amazement, the outer wall of the house

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

seemed to dissolve in flame and the whole roof lifted off.

Another missile tore past, this one miraculously threading its way through spokes, guy wires, and ladder-ways to exit the other end of the cylinder. Seconds later he heard gunfire, and a distant bloom of light signaled the missile's destruction.

A head poked out next to his. The wind-burnt homeless man spared Hayden a single glance before gaping at the next missile to appear out of the darkness. Belatedly, sirens were starting up throughout the city, animal voices dopplered weirdly by distance and rotation.

The new missile hit one of the other spokes. The unfolding red flower lit the stubbled face next to Hayden's, tiny arcs of reflection glinting in the man's eyes.

Then he heard shouts from above. Miles and the others were coming down. Hayden pulled his head in and clambered the rest of the way down to the street, where people were now running back and forth shouting.

He felt a momentary surge of exultation. Slipstream was paying at last! He hid his grin; laughing out loud would probably be a bad idea right now.

Hayden walked through the chaos for a few minutes. No more missiles appeared, but fire fighting crews were battling their way through the mob and fights were breaking out. All lights were on and somewhere engines were throbbing. He felt a pull to the right and creaking, groaning sounds echoed through the street as his weight diminished. The hit on that spoke must have spooked the gravity department.

His feet had unconsciously led him towards the docks. When he realized where he was, he frowned. He should just go home—ride this out. But where would Fanning be just now? This attack meant that the fleet would be mobilized. For all he knew, the admiral might be aboard his flagship already, and then Hayden would never get a chance at him.

With a curse he ran for the docks, where he had parked his bike.

4

At the docks the master was screaming, "No civilian craft, no civilian craft!" at a hundred panicked men crowding the doors. Hayden showed the security guard his pass to the Fanning estate and the grim-faced man reluctantly let him by. Once through the press of people he leaped on the back of his jet and kicked it into life. He dropped into turbulent air and the wail of attack sirens.

The sky was a storm of vehicles. Hayden had to twist and turn to avoid colliding with flocks of police cutters and ambulances. He kept his speed way down and held up his pass as he shot through narrow check-point gaps in ship-catcher nets that hadn't been there an hour before. In the distance other nets were slowly unfurling, distance making them appear like gray stains spreading in water.

Hayden never tired of flying between the cylinders of Rush at night. Even in this emergency, he found himself turning his head to watch the running lights of Quartet 2, Cylinder 1 as it showed him its black underside and, after he passed it, a crescent-shaped vision of glowing city windows and rooftops inside. The air was normally full of lanterns showing where invisible cables and stations waited in the dark; the lights were doubling, tripling now as he flew. To complicate matters, it looked as though a lightning storm was moving in: the sky below him was lit with intermittent flickers of white.

He was coming up underneath the admiralty cylinder when bright radiance slapped his shadow against the town's spinning metal hull. He nearly missed the entrance slot in surprise: they'd turned the sun on, seven hours early!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

After he'd hooked his bike to its crane and climbed off, he saw that this wasn't a normal dawn cycle. The skies visible through the arched windows of the dock were still a deep indigo. There must be some sort of spotlight feature to the sun that he'd never heard of before; Rush was pinioned in a beam of daylight but the rest of the world was a cave of night.

Another pilot was standing by the windows. "Now I believe it happened," he muttered under his breath. Hayden frowned and hurried out of the dock and up the stairs.

He could hear the tumult in the Fanning household before he even opened the servant's door. Inside, the kitchen staff were running back and forth piling cutlery in boxes, searching for anything with the Fanning monogram on it.

"What's going on?" Hayden asked mildly, sitting down at the large table beside the stove.

"They're going to war," said a maid on her way past. At that moment the chief butler swept into the kitchen and immediately spotted Hayden. "Griffin! Get into uniform. We're going to need you."

"Yes, sir."

He felt a pulse of resentment, but as he turned to go to the cloakroom, Lynelle, another of the maids, passed close by and whispered, "This throws all my well-laid plans to waste."

"—Uh, what?" He turned to look at her as she leaned in the kitchen doorway. She was pretty, he hadn't failed to notice that. But maybe he'd failed to notice her noticing him.

"I was going to throw a little party at my place on our shift's off-day. And I was going to invite you when I saw you tonight." She shrugged sourly. "Can't do it now."

"I—I guess not." He backed away.

She followed. "Was it really an attack by Mavery?" she asked.

"I don't know. Listen, I . . . I have to get ready for work."

"Oh. All right, see you." He knew she was watching him walk away; his ears burned.

Hayden had been careful to cultivate a respectful attitude since being hired. In truth, he hated it when the other servants were nice to him. How could good people, in all conscience, work for a monster? It seemed perverse and incomprehensible to him. He went to his locker in the men's cloak room and donned the livery of the Fanning household, quashing his usual nightmare about being spotted by some old acquaintance while wearing these colors. Once he was dressed, he sat down on the dressing bench for a moment to gather his courage.

Obviously, he would never get a better chance than this—if Fanning was home. Chances were he was in the admiralty office or the palace right now. But Hayden would have to assume otherwise, and do what so far he had not had a chance to do: venture unescorted into the Fanning's living quarters. He checked that the knife in the back of his belt was accessible, then stood up.

His hands were trembling. With a curse he strode out of the cloak room and made for the stairs. Somebody shouted after him, but he ignored them. Let them think he had business upstairs—well, it was true anyway.

He was feeling lightheaded. The lamps in their amber sconces throwing rings of light on the ceiling; the looming portraits of ancestral Fannings glaring at him from all sides; the distant shouting and clanging, all lent an unreal atmosphere to the night. Hayden passed several people on the stairs, one of whom was an admiralty attache; they all ignored him. As he reached the landing to the second floor, he heard muttering sounds coming from the admiral's office. So Fanning was here after all.

But not alone. Hayden paused out-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

side the door, which was ajar. Fanning was talking to someone in low, clipped tones. It came to Hayden that this was exactly where Miles and the other Resistance members would have wanted him to be, had he agreed to join their cause. For a moment the wild thought came to him that he might be able to kill Fanning and escape, and that if so, he could pull a double coup if he returned to Miles with strategic information. So he listened.

". . . Won't accept any of it. He's getting way too trusting in his old age." Hayden recognized Fanning's voice, which he had only ever heard from behind closed doors. Was the admiral talking to only one person, or was there a full-blown staff meeting going on in there? Hayden couldn't find an angle where he could look around the door without being seen.

"But our orders are clear," said another man. "We're to take the Second Fleet into Mavery and deal with them now."

"We don't need the Second Fleet to eradicate Mavery," said Fanning contemptuously. "And the old man knows that. He's afraid that the First Families are going to side with me and order the fleet to investigate this buildup of ships in the sargasso. If he moves us all into Mavery we can't do that."

"He doesn't believe the sargasso fleet's a threat?"

"He doesn't believe it's *real*." Hayden heard papers shuffling. "So. Here are your orders."

There was a pause, then Hayden heard a sharp intake of breath from the other man. "You can't mean this!"

"I can. We'll deal with Mavery, like the old man wants. But I'll be damned if I'm going to sit in the air occupying a second-rate province while somebody else moves in full force against Rush."

"But—but by the time we do this—"

"The sargasso fleet's not ready. That's clear from the photos. And we won't be able to put Mavery down right away; it'll take a minimum of two months before we're inextricably engaged with them, and whoever's behind this knows to wait for that to happen. We have the time."

The other muttered under his breath, then seemed to catch himself. "Sir. It's audacious, Admiral, but . . . I can see the logic of it."

"Good. Well, go to it, Captain. I'll join you when I've completed preparations here."

Hayden just had time to close the door of the linen closet as a captain of the navy in full dress attire strode out of Fanning's office and down the stairs.

As soon as he was gone, Hayden was out and sidling up to the door to the office. There was no one but Fanning in there now, he was sure of it. His mouth was dry, and his pulse pounding in his ears as he steeled himself for what he had to do. In all likelihood he wouldn't survive the night, but he had a debt to pay.

Taking a deep breath, he reached for the doorknob.

"There you are!"

He snatched his hand back as if it had been burned, and turned to find Venera Fanning standing at the head of the stairs. She had a hand on one cocked hip, and was glaring at him in her usual withering way. She was dressed in traveling attire, complete with trousers and a backpack thrown over her shoulder.

"I'm going to need a good driver," she said as she stalked up to him. "You're the only one I know who can handle himself outside of an air carriage."

"Uh—thank you, ma'am?"

"Wait here." She swept past him and into the office, leaving the door wide open. This gave Hayden his first glimpse of Fanning's office; it was not what he'd expected. The place was a mess. All four walls were crammed with bookshelves of differing pedi-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

gree. Books swelled out of the shelves and sheets of paper stuck out between the volumes like the white leaves of some literary ivy. More papers stood in precarious stacks on the floor, all leaning left to accommodate the coriolis tilt of the town's artificial gravity. The admiral himself was reclining in his chair, one foot propped up next to the table's only lamp. He scowled up at Venera as she walked in.

"This is low even for you," he said as he tossed a sheaf of papers onto the desk.

"Oh, come now," she replied levelly. "I'm just asserting my prerogative as a wife, to be with her husband."

"Wives don't travel on ships of the line, especially when they're going into battle!" As if to emphasize his words, a flash of lightning lit the sky outside the office's one narrow window. At least, Hayden hoped it was lightning.

"I admit I underestimated you, Venera," continued Fanning. "No—actually, I misunderstood you. This intelligence network you created, it's . . ." He shook his head. "Beyond the pale. Why? What's it for? And why are you so insistent on joining the expeditionary force that you're willing to blackmail your own husband to guarantee that I'll say yes?"

"I did it all for us," she said sweetly as she came around the desk to lean over him. Venera smoothed the hair away from Fanning's forehead. "For our advantage. It's the way we do things back home, that's all."

"But why come along? This will be dangerous, and you'll be leaving the capital just when it would be most advantageous for you to remain here as my eyes and ears. It's a contradiction, Venera."

"I know you hate mysteries," she said. "That's what makes you good at your job. But I'm afraid this particular mystery will have to remain unsolved for a while. You'll see—if all works out as I hope. For now, you'll just have to trust me."

He laughed. "That's the funniest thing you've said in a long time. Well, all right then, pack your things and get down to the docks. We'll be sailing tonight."

"Under cover of darkness?" She smiled. "You do some of your best work then, you know."

Fanning just sighed and shook his head.

Venera returned to the hallway, and taking Hayden's arm, drew him away from the office and towards the stairs. He let her do it. "I'm going to send a man around to your flat," she said to Hayden. "Tell him what to collect for you. You're not to leave the house today; wait for me by the main doors at six o'clock tonight, or your contract is terminated. Is that understood?"

"But what's—"

She waved a hand imperiously, indicating that he should retreat down the stairs.

She stood between him and the man he'd come to murder.

"Well?" she said. Venera seemed to see him for the first time; a muscle in her jaw flexed, causing the star-shaped scar there to squirm. "What are you waiting for?"

Hayden took a step down. He'd been planning this moment for years. Every nerve in his body screamed at him to rush past her, hurdle the desk, and plant his knife in Admiral Fanning's throat.

He took another step down.

Something came over Venera Fanning's face. Softness? Some subtle giving-in to an interpretation of his actions that he didn't understand? "It will all be made clear tonight," she said in as soothing a tone as she was likely capable of.

Although in his mind and heart Hayden was running up and back to the office, he found his feet take another step and another, and then he was

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

turning and clattering down the steps as though he actually had some other place to go. An agony of shame blanked his thoughts as he shouldered past one of the other manservants; he didn't come to himself again until he knelt in one of the servant's washrooms and, for long minutes, vomited wretchedly into the privy.

Admiral Chaison Fanning pulled himself hand over hand up the docking rope and did a perfect free-fall flip to land on the quarterdeck of the *Rook*. He'd practiced that maneuver many times when he was younger, just as he'd practiced wearing the uniform of the admiralty, keeping the cut of the jacket just so, the toeless boots polished to perfection and his toenails manicured and clean. The men watched for weakness using every possible standard—some couldn't follow a man with a thin voice, others couldn't respect an officer who didn't occasionally smile. Sometimes it seemed he'd spent the past two decades learning sixty varieties of play-acting, with a special role for every rung on the ladder to his success.

There was a particular style to be cultivated when you were leaving port; he needed to project confidence and purpose into the airmen so that they didn't look back and obeyed his orders without question.

Rook was not the flagship of the fleet. A mid-sized cruiser, she was beginning to show her age, and several years ago had been refitted to buttress Slipstream's dwindling Winter fleet. Still, she was a good ship: a hundred feet long, thirty in diameter, basically cylindrical, but with curving ends that terminated in vicious spiked rams. Her thick wooden hull was festooned with hatches and ports through which could be thrust rifles, rocket racks, jet engines, braking sails, or mutineers as the situation warranted. Many of the hatches were open as she hung in the air next to the docking scaffolds, a mile from the admiralty. The sun was glowering from behind the docks, whose caged catwalks cast long curving shadows across the amber hull of the ship, while tongues of light had found and lit random intricacies of its interior. Inside, the ship was a series of interlocking cells, most of them made of wooden lattices through which you could see men working or the tanned sides of tarpaulined and lashed crates. Some of the cells were big blocks of metal, such as the armory and the rocket magazine. And to the fore of the ship, just behind the bridge, an exercise centrifuge spun lazily. Its side walls made a turning mandala of admiralty notices, wooden walls, and plumbing. The men were required to spend a few hours a day in the centrifuge, and he would too; nobody was going to lose their fighting trim on this voyage.

Captain John Sembry saluted the admiral. His staff were lined up in midair behind him, their toes pointed precisely in the same direction. "The ship is ready, sir," announced Sembry.

A quick glance told Chaison that everything was where it should be, and the men were all working hard—or at least giving the impression of working hard. That was all that mattered, if things were truly ready. "Very good, Captain. I'll be on the bridge. Carry on." He turned and did a hand-over-hand walk through a narrow passage under the centrifuge, heading for the prow.

On the way to the bridge he checked his cabin. Venera was not there. Neither was her luggage. Fuming, he continued on up to the cylindrical chamber just behind the fore rocket battery. The navigator and helm were waiting, looking expectant. They hadn't yet received their orders and were expecting to be told to set a course for Mavery. He was going to surprise them.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

But not, apparently, yet. "Where is she?" he demanded of a petty officer. The man snapped to attention, slowly drifting upwards and away from his post.

"Semaphore said, on her way, sir!"

"And when was that?"

"Half—half an hour ago, sir."

He turned away, composing himself before the man could see his mask of professionalism slip. He was looking for something to do—a tie-down to criticize, a chart crib to fold—when the navigator said, "She's here, sir," with some relief in his voice. He was floating next to a porthole; Chaison stepped over fifteen feet of empty air to join him there, and look where he pointed.

Hanging limbs akimbo in the cage of a docking arm twenty meters away was a long-haired woman with an imperious nose and heavily made-up eyes. She wore an outlandishly bright jumpsuit that was also too tight in all the right (or, on a ship like this, wrong) places. Her hands were twisting nervously, but her expression was intent and focused as she directed some navvies to push a small mountain of crates and trunks through the narrow exit of the docking arm.

Aubri Mahallan was not the "she" Chaison had been hoping to see. He'd assumed this particular passenger was already on board. Forgetting himself he frowned virulently at her, as if she could see him behind the sun-drenched hull.

"That . . . costume . . . will not do," he muttered under his breath.

"Two women on board, sir," said the navigator neutrally. "It's . . ."

"Far from unprecedented," Chaison finished smoothly. "There's a great tradition of female ship officers in Virga, Bargott—just not of late in the enlightened principality of our beloved Pilot."

"No, sir, ah, yes sir."

"Summon the armorer to the chart room when she boards. I'll meet her there." Chaison left without another glance at the bridge staff.

Located behind the bridge, the chart room was the traditional inner sanctum of the ship's commanding officer. Nobody was allowed in here except the bridge staff and Chaison himself—nobody except for the one person he did find when he entered the drum-shaped room. Gridde, Chaison's chartmaster, was fabulously old and bent over—so much so that he retained the stoop even in free fall. As Chaison entered, he was teasing a tiny ruby clip out of its nestle in the crook of two fine hairs inside the chamber's main chart box. "Ah, Admiral," he said without turning around, "it's an interesting challenge you've given me this time."

Chaison's irritability evaporated, as it always did around Gridde. "It would have been a shame for you to retire without helping us navigate Winter."

"I've done it before," wheezed Gridde, smiling at Chaison's surprise. "Thirty-five years ago," continued the chartmaster. He returned his attention to the large glass chart box. Inside the box was a three-dimensional lattice of fine, almost invisible blonde strands—actual hairs, harvested from the rare young lady whose locks met Gridde's standard. Clipped to these strands were dozens of tiny jewel-clusters: a single sapphire stood for a small town, double-sapphires for larger towns, and so on. The box was a scintillating galaxy of light: sapphires, rubies, emeralds, topaz and jet, pale quartz and peridot. At the very center of the chart was a large diamond, which stood for the Slipstream sun. Gridde was adjusting the position of a ruby according to the latest semaphore information.

"Well, don't leave me drifting," said Chaison, crossing his arms and smiling. "What happened thirty-five years ago?"

Gridde snorted. "Why, the whole damn nation nearly drifted into Winter! Don't they teach you any history at

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

that academy? I remember a day when half the chart box was empty!" Despite the vehemence of his tone, his fingers were absolutely steady as they gripped the tiny ruby between a pair of wires and moved it infinitesimally to the left. "There. That ought to hold you for a day or two."

Chaison gripped the side of the chart table and pulled himself close to examine the three-dimensional representation of the one hundred miles of air surrounding Rush. "And our course?"

"Don't push me." Gridde slowly withdrew his wires and shut the case. "See, if this was one of those new gel charts, just drawing the wires out would move everything! You can't let them standardize on gel charts, sir. Would be a disaster."

"I know, Gridde, you've only told me a thousand times."

The chart-master sailed over to the wall and shut the metal bullet shield over the porthole. Now the room was lit only by the gleam of a gas lantern. Chaison wound up the lantern's little fan, without which it would starve itself of oxygen in seconds, and handed it to Gridde. The chart-master closed the metal door of the lantern, and now light only shone out of a tiny pipette. He carefully arranged this miniature spotlight in a set of flexible arms attached to the chart table, and aimed it.

Only a narrow column of jewels was lit now; the big diamond gleamed at its end. "The way-point," said Gridde, "is Argenta Town, the double-ruby." The two little red gleams were the only town within the beam of light. The beam represented the course the expeditionary force would take; Chaison could see that they would pass unseen by the majority of the local population.

"Good—" Chaison turned his head at a rap on the door. "Enter!"

Sunlight washed away the illusion of hovering above a miniature world. Silhouetted in the doorway was the curving shape of Aubri Mahallan. "That will be all, thank you, Gridde," said Chaison. "Come in, armorer."

As Venera Fanning's small party wound their way through the labyrinth of docking arms, Hayden stared at their destination with claustrophobic dread. Above him, below, and to all sides hung the bannered cruisers of Slipstream. These were the very ships that had invaded and conquered Aerie. He found himself searching the nearest ship for some sign of a scar—of burned hull, long since painted over—though the ship he had flown Can Two into six years ago had been incinerated before his eyes. He would not have been surprised had it turned up here, intact, a malignant ghost. Indeed, the cluster of bloated cylinders that shadowed the walkway seemed more nightmarish than real. This was the very last place in Virga he would have chosen to go.

"I'm definitely going to miss those Friday evening soirees," Venera was saying to some acquaintance of hers who had come to see her off. "Strange. The crowd has stopped cheering."

Only a low muttering came from the wall of people who pressed against the naval base's security netting. Hayden knew exactly why, but he was obligated to hold his tongue in the presence of his mistress. The crowd had come out to watch the fleet depart. They were eager for spectacle—for the proof that the Pilot was acting decisively after last night's outrageous attack on the city. People had been arriving all day, forming a curving half-shell made of human beings like tiles in a mosaic, that gradually came to obscure the backdrop of Rush's whirling towns. Charged up and indignant, they periodically broke into chants and songs, while continuously flinging sandwiches, drinks, and children up and down the surface of the wall. Bikes and folded wings, picnic baskets

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and man-sized wicker spheres containing food and souvenir vendors made a kind of base coat behind the human surface.

The fleet had been due to depart an hour ago. The sun was shutting down for the day, its light sputtering and reddening. The light made the docks seem like an alternation of photographs with different exposures and tints—now sepia, now plum-red, now black and white. As soon as the sun shut down, heat would flee the air. Few in the crowd had dressed for that. So now they were complaining.

Also muttering were the non-coms and military police who were hurrying Venera's party down the arm to the shadow-striped *Rook*. As they approached, the ship's jets growled into life for a moment, and it began to rotate until it was vertical compared to the approaching party. The rest of the ships began executing the same turn as word of their initial course and heading was relayed from the *Rook*.

"Ooh, Venera," said the socialite clinging to Fanning's arm, "they're excited to see you!" She waved at the crowd, which had burst into song again at the sight.

The grumbling engines and motion of ships made Hayden's head spin—but he kept going. There was only one way he was going to redeem himself for his earlier cowardice. Fanning was leaving Rush, and Hayden had to follow.

And if—an idea so heretical he refused to take it seriously—if he should be unable to kill Fanning (he would never *choose* not to!), then Hayden could still do some good by acting as a spy aboard the *Rook*. If what he'd heard outside Fanning's office was any indication, there was more to this expedition than met the eye.

They reached the end of the docking arm. Hayden hauled on the rope to halt the forward drift of Venera's trunks while she showed her papers to the waiting deck officer. He barely glanced at them, waving her on.

"Now don't forget my camera!" shouted the socialite from behind the shoulders and arms of the MPs. Venera's other friends waved and shouted similar platitudes, as though Lady Fanning were going on a Sunday cruise and not leaving the country under mysterious circumstances. Hayden gathered the two trunks, each by its leather handle, and stepped across the two-meter gap between the arm and the ship.

As the big doors swung shut behind him Hayden was met by a chaos of detail: beams and ropes in gaslight, the smell of jet fuel and soap, racks of rifles and swords, the flickering motion of a giant centrifuge wheel—and everywhere people, a mob of silent men all of whom seemed to be looking at him.

He spun around, because it was Venera Fanning they were staring at. She stared back for a second, a half-smile crinkling the scar on her chin. Then she turned and shot in the direction of a narrow corridor that passed under the centrifuge. Hayden was left holding her bags.

As he moved to follow her he realized that only one other person had accompanied them on board: a nondescript, passive-faced man of middle age. He looked like some minor bureaucrat. Now he smiled at Hayden.

"But the other servants—" They had come here in a large group. Surely Hayden wasn't the only one who was going?

"You're the driver?" asked the bland man; his voice was as colorless as his appearance.

"Uh . . . yes."

"Stow the bags in the captain's cabin and then go to the centrifuge. You bunk with the carpenters."

"Ah." He stuck out his hand tentatively. "I'm Hayden Griffin."

The man shook it distractedly. "Lyle

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Carrier. Get going, then."

Hayden grabbed the trunks in an awkward embrace and went to find Venera Fanning.

Darkness shuttered the sky well before the last ship had left the docks. Chaison Fanning sat in the command chair, chin on his fist. He had no duties at this moment: the ship was in the hands of Captain Sembry. Sembry's voice rang out confidently, sending commands down the speaking tubes to the engines and rudder gangs. All eyes were on him just now, and that was a relief.

Chaison rotated a little cup-shaped object in his fingers. It had been given to him by that problematic armorer, Mahallan, a few minutes ago. This device was intended to make real for him an idea he'd thought ridiculous when Venera had first brought it to him. He supposed he should try it.

It was hard to focus past his anger, however. He glanced around; nobody was looking at him. No, they wouldn't. But it would be all through the fleet in hours. This was a humiliation he wouldn't be able to escape.

Why had she done it? He wondered. More importantly: why had he let her? He could have set sail and forced her to catch up. Except that she had information that she could—and would—use against him, her own husband, if he didn't do exactly what she said. He had no doubt she would move against him—he had known Venera long enough not to doubt her ruthlessness.

He gripped the cup tightly and almost threw it at the wall. But that would just add to the talk later, he knew. With a sigh he held it up to his ear.

The sound was surprisingly loud—he pulled the cup away, then gingerly replaced it. What he heard was a roaring din—a steady hissing, weird warbling noises that came and went, and a sound like giant teeth grating. Overlaid on all this was a deep tearing sound, like some impossibly heavy fabric being ripped. It went on and on, hypnotic, an argument between demons.

He took the speaker away from his ear. This was supposed to explain everything, this incessant grumbling. He did admit it was a compelling demonstration, but in no way did it lend credence to any of the wild claims Venera had made.

Anyway, he didn't care. All Admiral Fanning could think of right now was the fact that his wife had, no doubt deliberately, made the national fleet of Slipstream . . . late.

5

A column of ragged clouds twisted like smoke in the night. The shapes wheeled grandly like wary duelists, occasionally testing one another's defenses with half-hearted lightning bolts. Every now and then, a transient corridor of clear air would open to some distant sun through the shuffle of gray shapes that receded for thousands of miles in every direction. Then the flanks of one or another silent combatant would momentarily throw the rest into invisibility as it shone in shades of dusty rose and burgundy.

These were young clouds, the progeny of a mushroom-shaped column of warmer air that had penetrated into Slipstream territory earlier in the day. Being young, these banks and starbursts of mist had just begun to condense. The realm through which they drifted was filled with the remnants of an earlier mass of clouds: its droplets had come together and fused over the hours and days, each collision making fewer and larger drops. Now great spheres of water, some head-sized, some as large as houses, punched through the clouds like slow cannonballs, adding to the chaos of the mixing air.

Wakeful citizens on bikes hovered outside the two towns and a farm that

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

were the only habitation for miles. The sentries kept a watch out for any large mass of water that might loom out of the dark on a collision course with the spinning wheels, or the dark nets of the farm. For one sentry, the only sound was the whirring of the little fan that kept his lantern alive as he waited in silence, cloak drawn around his shoulders to ward off the damp, feet ready on the pedals to kick his bike into motion.

Thus huddled, he at first didn't notice something nose out of a cloud shaped like a bird's head. When he finally spotted it he muttered a curse, because at first it looked like a town-wrecker of a waterball. He reached for his horn with numb fingers, but as he raised the brass horn to his lips he hesitated. The shape no longer appeared rounded, but rather like an extra beak to the diaphanous bird, this one hard and sharp. It was the prow of a ship.

Now that he could see what it was he realized he'd been hearing it for a minute or two already—a distant whine in several keys from its engines. He could also see two spotter bikes weaving in spirals ahead of it. You never knew what might lurk inside a cloud, so the spotters went ahead of the ship to ensure that there were no rocks, water balls, or habitations in the way. On dark nights like this, spotters sometimes found obstacles by running into them. So ships tended to move slowly at night.

They also used headlights to probe the blackness—that was simple prudence. This ship, however, was running dark. As it left the cloud in a whirl of eddied mist, another nose appeared behind it; and another.

The sentry raised the horn again, suddenly fearing an invasion; then he saw the lantern-lit sigil of Slipstream on the hull of the lead vessel. He slowly lowered the horn and clipped it to his saddle. He was a citizen of Aerie; he would not pick a fight with Slipstream tonight. In fact, he would be happy not to be noticed by them at all.

Seven big vessels passed by, all dark except for their running lights. As they disappeared into the black, the sentry shivered and turned his attention back to his watch. This would be a story for the morning, perhaps, but he wasn't about to fly over to the other watchers to compare notes. Somehow he felt it better not to speak of these ships while darkness reigned.

Hayden hid in his coffin-sized bunk for as long as possible. He'd spent an uneasy and unpleasant night here, but was still reluctant to emerge into the reality of his new situation.

His bunk was at the bottom of a stack in the exercise centrifuge. He felt like a disused book shelved away in a particularly cramped library. He couldn't sit up because the bunk above his was only inches away from his nose. Each time he rolled over the world seemed to turn in the opposite direction—a familiar enough sensation from town living, but magnified by the small size of this wheel. The thing rotated five times a minute but only provided a tenth of a gravity for all that effort. Its axles had creaked monotonously, men on either side of him had snored in different rhythms, and someone had created prodigious amounts of bad smell that hovered in the air for what seemed hours.

Now his bedding was vibrating with footfalls as an endless parade of airmen ran laps around the wheel. The sleeping level had only one narrow aisle between the stacks of bunks, so the runners' feet slammed down inches from Hayden's head. Finally, when someone stumbled and kicked his shelf, he cursed and rolled out into the narrow space between the bunk stacks.

"Out of the way!" The boatswain pushed Hayden as he made to step into the aisle. For the next few minutes he ducked from bunk stack to bunk stack

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

as other airmen made a game of trying to hit him on the way by. Their crude laughter followed him as he scrambled up the ladder to the upper level of the wheel.

Last night the boatswain had made it very clear that on board this ship, Hayden was little more than dead weight. He had gone to bunk with the carpenters as ordered, but they didn't want him around either. He'd found an empty bunk in the centrifuge, but clearly he would have to locate some less trafficked part of the ship or he was going to be covered in bruises before the end of the day.

The upper level of the wheel was simply a barrel fifteen feet in diameter. Half of it was taken up with crates, the other half was bare flooring where men with swords were circling one another under the watchful eye of a drill sergeant. Hayden eyed the crates, and finally climbed up on a stack, losing weight with every step. He settled in to watch the fencing technique of the men below.

"You!" He looked down. It was the boatswain again. He was a florrid man with a crisp uniform and a shock of carrot-red hair. His eyes protruded when he glared, which was most of the time. Now his lips flapped as he said, "That's delicate equipment, get off it!"

Hayden sighed and hopped from the crates up to the centrifuge's entranceway, at its hub. Surely there must be a quiet spot somewhere.

All the ship's ports were open, it seemed, and a cold wind blew through the interlocking chambers of its interior. Everywhere he looked men were hauling ropes, shifting boxes, or hammering something. He decided that an open cargo door was his best bet and flew over to perch on its inside. A stiff wind flapped past just a foot away but he'd found a pocket of relatively still air. He curled up to look out.

The sun glowed far to aft. It was dim and red with distance; they must be near the border. The clouds they passed threw hazy shadows like fingers pointing the way ahead.

Dotting the sky around him were other ships. He counted six; there might be more on the other side of the vessel, but this was a far cry from the dozens that had left port. As the *Rook* slowly rotated around its axis he was able to verify that there were only seven ships in this group, counting his own. Where was the rest of the fleet?

They skirted the sides of a cloud-mountain and suddenly the air ahead opened up, clear of obstructions. Hayden blinked in surprise. He faced a deep blue abyss—a span of darkness that ran from infinity below to infinity above, and stretched endlessly to both sides. The *Rook* was driving straight into Winter.

He couldn't understand how he'd come to be here. He'd had the chance to kill Fanning, and he hadn't done it. That made him a coward—but, undeniably, there was also something big going on, something beyond an imminent attack on Mavery. He might be the only spy Aerie had aboard these ships. As he'd tossed and turned last night, he'd kept coming back to the conclusion that it was his duty to find out what he could, and report it back.

When he no longer had a role to play, he would kill Fanning. This time there would be no hesitation.

"Hey you!" He turned to find himself facing a boy with a rat-like face who wore an airman's uniform several sizes too big for him. "You Griffin?" he asked belligerently. When Hayden nodded, he jabbed a thumb in the direction of the centrifuge. "Yer wanted in the lady's chamber." He smirked.

"Thanks. You can call me Hayden, by the way. What's your name?"

"Martor," said the boy suspiciously. "I'm the gopher."

"Good to meet you, Martor. By the way, where can a guy get a meal

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

around here?"

Martor laughed. "You missed it. That was six o'clock. Not that you could have et with us men, anyway. Yer gonna half to find yer own meals."

"How much to get that arranged for me?"

Martor's eyebrows lifted. He thought about it. "Six. No less."

"Done." Hayden went forward, a little less deferential to the other men now that he had a destination.

It wasn't Venera waiting for him outside the captain's quarters, but the bland Carrier. He stood on the air with his his arms crossed, toes pointed daintily. He frowned at Hayden. "You have duties," he said without preamble.

"I, uh—yes?"

"Lady Fanning has secured a bike for our use. This is not a military machine but a fast racer with sidecars. You are to familiarize yourself with it. Three hours a day, no more no less."

"Yes, sir!" So they wanted him to fly? Well, it would be their funeral. "What model is it?"

Carrier waved a hand negligently. "Don't know. Anyway, the rest of your time will be spent assisting the new armorer. We were *told*," he said with a faintly unpleasant moue, "that you were mechanically minded."

"Well, I tinker with bikes—"

"Good. You are to report to the armorer immediately. That's aft," Carrier added helpfully.

"Okay, but what will I—" Carrier didn't even frown; he just turned his head away almost imperceptibly. Hayden got the message.

A little of the stifling gloom that had settled on him last night lifted as he headed aft, but he was still bewildered at how quickly and thoroughly he'd gotten himself into this situation. If he'd had any sort of courage he'd have killed Fanning yesterday. The fact that he hadn't, and was now effectively working for the enemy, made him feel deeply sick.

"—Know where you're going, do you?" said somebody. Hayden looked down to find Martor squinting at him. "It's this way," he continued, pointing past the drooping bellies of a row of fuel tanks.

"Thanks. Hey—when I looked outside earlier, I saw we were headed into Winter? What's all that about?"

Martor looked uncomfortable. "Don't know. Nobody's telling us anything, not yet anyway. You saw we split off from the main fleet? Rumor is we're going to come around behind the enemy. But that don't make no sense. Enemy's farther *in* to the suns, not out here."

"You mean Mavery?"

"Who else would I mean?"

Martor was trailing Hayden now, shifting his weight and fiddling with his hands, much more like the boy he was than the tough man he tried to be. "Winter's nothing to worry about," said Hayden. "I've been there."

"You have? Is it true that there's capital bugs with suns in their bellies? And whole countries frozen solid, guys about to stick each other with swords when their suns went out and their whole armies covered in ice now?"

"Never saw anything like that . . ."

"But how would you know, since it goes on forever?"

"*Forever?*" Somebody laughed. "I don't think so."

An irregularly shaped box was stapled to the outer hull under a mad web of netting. The box had a perfectly ordinary door in one of its facets. The voice had come from that direction. It sounded suspiciously like a woman's.

"You're gonna tell me that's the armorer," Hayden whispered to Martor. Martor nodded vigorously. "Thought so."

He stuck his head through the door. There was indeed a woman fitted into the intricate mess like a main cog in a watch. She was opening one of several dozen boxes crammed in around her,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and was currently upside down compared to him so that all that registered at first was the halo of writhing brown hair that surrounded her face and the fact that she was dressed entirely in black save for a glimpse of burnt-orange silk that peeked out below her collar. He rotated politely to match her orientation and stuck out his hand. "I'm Hayden Griffin. I was told to assist you."

Her hand was warm, her grip strong. "Aubri Mahallan. Who told you to assist me?"

"Um, man named Carrier."

"Oh, *him*." She dismissed the man's entire existence with those two words. Mahallan had a heavy accent, bearing hard on sounds like *er* and *oh*. Right-side up, she looked as intriguing as she sounded, her skin pale and perfectly unblemished like the most pampered courtier, her eyes wide in a perpetually startled look and over-emphasized with black makeup. Her mouth was broad and was always twisting into one or another expression so that a constant parade of impressions flickered across her face. Just now she was pursing her lips and squinting at Hayden. "I suppose I can use you for something. And you!—" she aimed her expressive gaze past Hayden at the open door. "This is the fifth time you've blocked my light this morning. Guess I'm going to have to find something for you to do as well."

"Yes, ma'am," came Martor's voice faintly from somewhere outside.

"But I can't have ignorant savages working for me," continued Mahallan as she spun and opened a port-hole to let a blast of fresh air into the junk-filled cell. "Winter does not go on forever—or rather, it does, but only in the sense that you could go around the outside of a dinner plate forever. Do you understand?"

"No, sir!" said Martor, still invisible.

"Come in here!" Martor peeked around the door jamb. Somewhere outside, a gang of airmen was engaged in a swearing contest. "And close the door, will you?" added the armorer. Hayden shifted to let Martor do that, and found himself close enough to Mahallan that he could smell her perspiration.

Her attention was fixed on Martor. "Do you believe this world goes on forever in all directions?"

"Yes, ma'am," said Martor with no trace of irony. "Rush came out of Forever, two generations ago, and we attacked the countries here. After we've cut through them all, we're going back to Forever, out the other side of the countries."

"I see we have our work cut out for us," said the armorer with an amused glance at Hayden. "Young man, do you know what a balloon is?"

"A bag for storing gas," said Martor instantly.

"Good. Well, Virga, your world, is a balloon. It is an immensely big balloon, in fact, fully five thousand miles across and orbiting in the outer reaches of the Vega star system. Virga is artificial. Man-made."

"Ma'am, that's very funny," said Martor with a stilted grin.

"It's utterly true, young man. Is it not a fact that your suns are artificial? So, then, why not the rest of the world, too?" Martor looked a little less sure of himself now. "Now, the problem is that even a fusion sun capable of heating and lighting everything out to a distance of several hundred miles is just a tiny spark in a volume this size. Especially when clouds and other obstacles absorb the light so readily. Sixty, eighty, even a hundred suns aren't enough to illuminate the whole interior of Virga. So, we have large volumes of air that are unlit, unheated—volumes of Winter."

"I'm with ya," said Martor.

"But these volumes don't go on forever. They end, one way or another, at the lighted precincts of some other na-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tion, or at Candesce if you head straight towards the center of Virga. Or they end at the skin of the world, where icebergs crowd and grind like the gnashing teeth of a god. And your asteroid, Rush, orbits very slowly around the middle of this world, tugged by the almost imperceptible gravity the air creates."

"Now you're having me on," said Martor.

Mahallan sighed extravagantly, but couldn't hide a smile. "Go on. You're taking up my air. You," she said to Hayden, "stick around and help me unpack some of these boxes."

The seven ships killed their engines a dozen miles into Winter. They drifted for a few minutes, then with slow grumbles of their turning engines they slid into a star formation, each one pointing out from a central point. Lines were cast from nose to nose, and the captains of six ships hand-walked across to an open port in the side of the *Rook*. In all directions, darkness swallowed distance and detail.

When Admiral Fanning entered the *Rook's* chart room he was pulled up short by the vision of the captains clinging to floor, walls, and ceiling like so many wasps in a paper nest. They were all identical in their black uniforms, rustling and moving slightly. He could practically hear a subliminal buzz coming from them.

He shook off the impression and glided to his chair by the chart table. "You've all been very patient with our secrecy," he said as the last visiting captain ducked past him to loop a hand through a velvet wall-strap. Now that he thought about it, the idea of these men as wasps seemed more and more apt. They were dangerous, focused—and for the most part, dumb as planks. Perfect for the job he had in mind.

"I'm sure you've had your suspicions about where we're going. I'm equally sure," he said with a smile, "that your crews have been devising all kinds of extravagant ideas of their own." There was a polite smile from the swarm in return.

"Now that we're out of semaphore-range of any potential spies, we can make a general announcement."

"It's about time!" Captain Hieronymous Flosk, the oldest and least patient of the company, leaned into the light from the chart table. The glow made his face a mask of crevasses and pitted plains. "This secrecy is ridiculous," he grated. "We don't have to skulk around hiding from Mavery. Hit them direct, and hard. You'd think that would be obvious," he sniffed.

"Well, you'd be right," said Fanning, "if Mavery were our target."

Several of the captains had been muttering together, but these words shocked them silent. "What do you mean?" asked Flosk, his voice momentarily reduced to a whine. "After the damned sneak attack the other day—"

"Almost certainly not them," said Fanning drily. "Oh, their munitions, right enough. But Mavery's border dispute with us has been trumped up by a third party—one with deep pockets and spies throughout Slipstream." He took one of the slides his wife had prepared for him and slipped it into the hooded lantern under the chart box. Opening a little door on the side of the lantern, he projected the image onto the wall behind him.

"This," he said, "is a secret shipyard of Falcon Formation. One of, uh, our spies took this photo less than a week ago." Several of the captains rotated in place to try to find a better view of the picture. Fanning glanced back to verify that he'd chosen the correct slide: it was Venera's picture of the giant warship.

"The dreadnaught you see in the deep background is fifteen hundred feet long," he announced. Again, the captains went still. "Nothing like it has

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ever flown in Virga. It's big enough to be a carrier for mid-sized hunter sloops, as well as a substantial assault force. We believe this ship will be the flagship of a fleet aimed at Slipstream. We have learned that they are using the dispute with Mavery as a ruse to draw our forces away from Rush. Once our fleet is entangled in Mavery, they will move in and take the city." He didn't have to add that Rush *was* Slipstream. Take one and you had the other.

There was a long silence. Then Flosk said, "Who's this 'we' who believes all of this crap? You and the Pilot?"

"The Pilot, yes," Fanning lied. "He is well aware of our nation's failings in the espionage area. He's taken steps—hence the pictures." He changed the slide for another that showed the shipyard itself. "That's the strategic situation. I'm sure you can appreciate how important it's been to keep our knowledge of the situation secret."

"Wait," said someone. "You mean we're going to attack *Falcon?*"

"Suicide," someone else mumbled.

"Clearly we need any advantage we can get," said Fanning with a reluctant nod. "Your ships were either designed as Winter ships or have been refitted as part of a Winter fleet. These upgrades have been going on for some years, since my predecessor discerned a need for such a fleet."

"But these are hardly the best Winter ships," objected Flosk. "The new ones are off with the force that's heading to Mavery."

"Naturally. Mavery and Falcon will notice if our finest Winter ships don't show up for the border dispute. Your ships—and I hate to put this indelicately, gentlemen—are the inconspicuous ones. Not very powerful, not very important. Nonetheless, they are all rigged for operations in cold, darkness, and low-oxygen conditions. They will be sufficient."

He closed the cover on the projector and restored the light to the chart box. "This is the local constellation of nations," he said. "We are here. Falcon is there." The chart box contained dense clouds of colored sparks, each hue representing a different nation. The nations coiled around and pressed against one another in intricate contact, like the internal organs of some creature of light. "The chief nations of Meridian all follow the rise and fall of the Meridian Five Hadley cell that's powered by heat from the Sun of Suns, which is below the table in this view. Rush Asteroid is largely unaffected by the air currents and continues to follow its orbit around Candesce, at something less than walking speed. As you can see, Rush will soon leave Aerie and migrate into Mavery's territory. But after that . . ." He turned the box to show a mass of glittering green stars that took up much of one side of the box. "After that we will by force of celestial mechanics, have to pass through Falcon."

Three suns—diamonds among emeralds—gleamed within the broad dazzle of green.

"Now, here is the location of the secret shipyard we discovered." He flipped a lever in the base of the map box. All the little pinpricks of light dimmed save for one amethyst that lit up deep inside Falcon territory.

The captains broke into a babble of complaint. Flosk burst out laughing. "How are we expected to get to that spot without fighting our way through the whole of Falcon?"

"Simple," said Fanning. "The location of the shipyard is secret because it's in an underpopulated area—a volume filled with sargassos. It's really at the terminus of a long tongue of Winter that extends hundreds of miles into Falcon. The sargassos shade this volume and much of it is oxygen-poor. A wilderness. We're going to circle all the way around the Meridian constellation and sneak in through this alley of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

dead air."

". . . And raid the shipyard," said somebody. There were nods all around.

"Well, it's bold," said Flosk grudgingly. "Still suicidal. But then we're not too many ships. Slipstream can afford to lose us."

"I have no intention of sacrificing us," said Fanning.

"But how are we going to survive and get home again?"

"That's a part of the plan that has to remain secret for now," said the admiral. "But what it means in the short term is that, before we circle around through Winter, we have to make a . . . a detour."

It might have been two thousand miles away; it could have been twice that. They were never able to tell her for sure. But somewhere, and not too long ago, there had been a war.

Nobody knew whether the shot was fired by a lone sniper, or whether it was one of a salvo loosed in the midst of a confused melee involving thousands of men. But it was a military-grade weapon of some sort, that much was sure. The bullet had come out of its muzzle at a velocity of more than a mile per second. It outran its own sound.

She knew what had happened next. The bullet had gathered its experiences with it as it flew, remembering what it saw and where it went; and these memories came to Venera Fanning now and then, as dreams and nightmares. They must be from the bullet, there was no other possible source for them. She herself could never have imagined the vision of fantastically-prowed vessels ramming one another and tumbling in burning embraces into blood-red clouds. Nor could she have thought up the rope-connected freefall city the bullet had sailed through shortly after being fired. The city owned no wheeling towns. Its towers and houses were nodes in a seemingly infinite lattice of rope, and its scuttling citizens were long as spiders, their bones fragile as glass. The bullet passed through the city going hundreds of miles per hour, so the faces and rippling banners of the place were blurred and unidentifiable.

The bullet shot past farms and forests that hung in the air like green galaxies. In places the entire sky was alive with spring colors as distant suns lit the delicate leaves of billions of independently floating plants, each one clinging by its roots to a grain of dirt or drop of water. The air here was heady with oxygen and, for the humans who tended the farms, redolent with the perfume of growing things.

In contrast, the vast expanses of Winter that opened up ahead of the bullet were clear as crystal. Falling into them was like penetrating a sphere of purest rainwater, a deep fathomless blueness wherein the bullet cooled, and shrank in on itself just a little. It threaded through schools of heavily feathered, blind fish and past the nearly identical birds that fed off them. It entered a realm of sky-spanning ice arches, a froth of frozen water whose curving bubbles were tens of miles on a side. Black gaps pierced their sides. Snow nestled in the elbows of icicles longer than Rush's shadow. Here the air was dense, exhausted of oxygen as well as heat. The bullet slowed and nearly came to a halt as it reached the farther edge of this shattered cathedral of ice.

But as it began a slow tumble and return to the blue intricacies behind it, an errant beam of light from Candesce welled up from below. The glow heated the air behind the bullet just enough to make a sigh that welled out and pushed it away. Again it tumbled into dark emptiness.

Winter did not rule all the empty spaces of Virga. There were columns of warm air hundreds of miles long

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

that rose up from the Sun of Suns. Before they cooled enough for their water to condense as clouds, they were transparent, and Candesce's light followed them up, sometimes penetrating all the way to Virga's skin. The bullet strayed into one such column and changed course, rising now and slowly circumnavigating the world.

It was the passage of an iceberg that galvanized the bullet into motion again. An eddy of the passing monster put a sustained wind at its back and soon the bullet was cruising along at a respectable thirty miles an hour. On the crest of this wavefront it entered a dense forest that had supersaturated itself with oxygen. It narrowly missed a hundred or so of the long spiderweb filaments of trunk and branch whose weave made up the forest. But then it happened: the bullet rapped a solitary, tumbling stone a few miles in and a few sparks swirled after it. One spark touched a dry leaf that had been circulating in the shadowed interior of the forest for ten years. The leaf turned into a small sphere of flame; then the other leaves floating nearby lit, and then a few nearby trees.

An expanding sphere of fire pushed the bullet faster and faster. Mile after mile the storm of flame pushed through the supercharged air, in seconds consuming thread-like trees bigger than towns. The forest transformed itself into a fireball bright as any sun in Virga. When it burned out its dense core of ashes and smoke would contain a sargasso—a volume of space sheltered from the wind by leagues of charred branch and root, where no light nor oxygen could be found.

The bullet was indifferent to this fate. It rode the explosion all the way out of the forest. When it left the roaring universe of flame it was once again speeding at nearly a mile a second. Several minutes later it entered the precincts of Aerie. It flashed past the towns and outrider stations of Slipstream. It narrowed its focus to a quartet of towns in the formation known as Rush. It lined up on a single window in the glittering wheel of the admiralty.

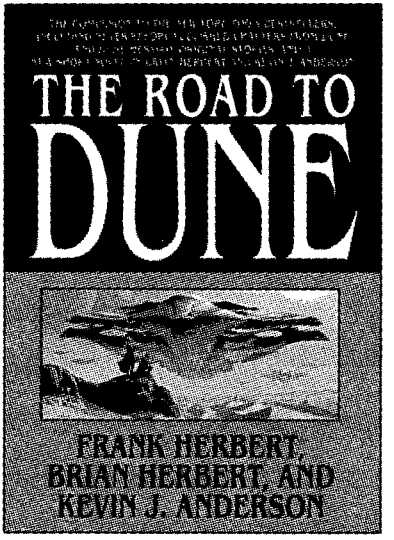
It stopped dead in Venera Fanning's jaw. Some blood tried to continue on, but that only made it a few meters further. And while the doctors did dig it out of Venera's throat, it had remained in the admiralty ever since.

Until now. As Venera slept uneasily and dreamed her way back down the long trajectory of the projectile, it bumped slowly back and forth inside the lacquer box in her luggage where she kept it. Its journey was not over yet. ■

To be continued.

READERS: If you are having problems finding *Analog Science Fiction and Fact* at your favorite retailer, we want to help. First let the store manager know that you want the store to carry *Analog*. Then send us a letter or postcard telling us the full name and address of the store (with street name and number, if possible). Write to us at: *Analog Science Fiction*, Dept. NS, 6 Prowitt St., Norwalk, CT 06855-1220. Thank you!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



Frank Herbert, Brian Herbert, and Kevin J. Anderson

THE ROAD TO DUNE

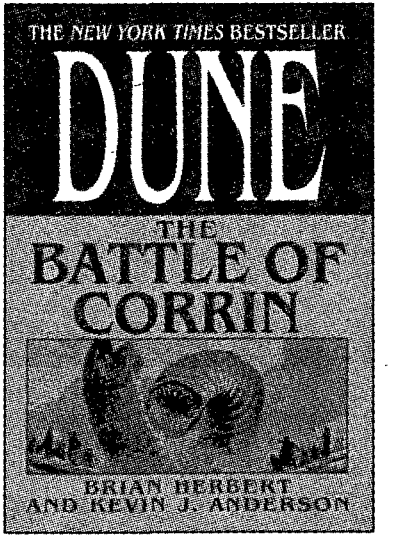
0-765-31295-6 • $25.95/$34.95 Can.

New in hardcover

A companion to *Dune*, the greatest SF novel of all time. Includes unpublished chapters from *Dune* and *Dune Messiah*, and also contains "*Spice Planet*," a short novel by Brian Herbert and Kevin J. Anderson based on Frank Herbert's outline for an alternate version of *Dune*.

"One of the monuments of modern science fiction."

Chicago Tribune on *Dune*



Brian Herbert and Kevin J. Anderson

DUNE: THE BATTLE OF CORRIN

0-765-34079-8 • $7.99/$10.99 Can.

Now in paperback

The tide of titanic struggle once again shifts against the warriors of the human race; the greatest battle in science fiction history is at hand as humans and machines face off for the last time.

"*Dune* addicts will happily devour Herbert and Anderson's spicy conclusion."

Publishers Weekly

TOR

www.tor.com

LICENSED TO NZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Homes of the Gods

Stephen L. Gillett, Ph.D.

As real estate, red dwarf stars may have some usually overlooked advantages.

Who'd want to visit a red dwarf? I mean, *really* . . . kinda like scheduling a disco dance by candlelight. Quite a few science fiction stories have spoken of the lurid light of a red sun: Robert L. Forward in *Rocheworld*, Poul Anderson in *Trader to the Stars*, and many others. David Brin's Hugo-winning "Crystal Spheres" even suggested that people couldn't live around "badstars" such as "tiny red dwarves [sic][1]." The mental image is no doubt of trying to peer through a ruddy gloaming, like the dull light cast by the coals of a campfire. With such a mind's eye view, little wonder that so many SF stories start out on "the planet of a G-type star. . . ."

The Color of a Red Sun

Except that this whole mental image is *wrong!* A "red" dwarf isn't really "red" at all, at least to your personal eyeballs. A "red" dwarf is "red" only by comparison to hotter stars, whose wavelengths are shifted to shorter (and hence "bluer") wavelengths. The temperature of even the dimmest type M dwarf, those little "red" suns, is about the same as that of the filament in an incandescent light, say about 2200 kelvins or so, and many are a good deal hotter than that. The light won't look red at all, and the eye is sufficiently adaptable that scenes will look normal. The temperature of something truly "red"—a charcoal fire or glowing stovetop, say—is less than 1000 K. In my former rock lab, we used to heat samples almost to 700°C—i.e., to nearly 1000 K—and at that temperature they're glowing a bright cheerful orange. (Obviously, when Jerry Oltion and Lee Goodloe talked about the "bloody light" of dawn

[1] Thank you, J.R.R. Tolkien!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Table 1. The Sun and some "red" dwarfs compared.

	Sun	Proxima Centauri	Barnard's Star	Wolf 359
Distance (light-years)	---	4.2	6.0	7.8
Temperature (kelvin)	5770	3050	3300	3000
Spectral Type	G2	dM5e	M5 V	M6
Luminosity:				
Visual	1.0	0.00006	0.00044	0.00002
Bolometric	1.15	0.00151	0.00544	0.00082
Vis./Bolo.	87%	3.7%	8.2%	2.5%
Peak wavelength (microns)	0.50	0.94	0.87	0.97
Mass (Sun = 1)	100%	18.1%	25.4%	15.4%
Average distance of Earthlike planet (Earth = 1)	1.0	0.036	0.069	0.027
Period (Earth days)	365.24	5.92	13.1	4.06
Solar day (Earth days):				
3/2 lock, prograde	---	11.84	26.2	8.13
retrograde	---	-2.37	-5.24	-1.63
Average disk size (degrees)	0.5	2.1	1.8	2.3
(Implies radius w.r.t. Sun =)	1.0	0.073	0.119	0.056
Tidal force (Earth on Moon = 1)	0.0056	21.5	4.4	45.6

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

from a red dwarf star, in their Nebula-nominated story "Contact," (November 1991) the "star" was actually a brown dwarf.)

Let's look more closely at such "bad" stars. I've collected data for three nearby "red" dwarfs (hereafter "RDs") in Table 1. As you can see, their temperatures range from about 3000 kelvins to 3300 kelvins—that is, from the filament temperature of a very bright "white" incandescent light, like those used for projectors or stage lights, to even hotter. Close up, these stars will hardly look red!

To be sure, most of the light they put out *does* lie in the infrared, with a wavelength at the peak intensity of around one micron. (For comparison, the reddest light you can see, at the threshold of perception, has a wavelength of about 0.7 microns or 700 nanometers). In fact, only a few percent of the radiation such stars put out lies in the visible; their light is mostly infrared (Table 1). Again, that's how they justify their name of "red" stars: their light *does* mostly lie toward the red, even though that's not perceptible to the eye.

By the way, this also is why ordinary incandescent lamps are so energy-*in*efficient. Just like these "red" stars, they shine just through being hot, so they put out lots more infrared than visible light. Which is completely wasted: not only can't you see it, but it heats up the surroundings, which often means that extra cooling is needed—and sometimes all that extra heat even starts fires.

Also because of that big infrared component, we have to be careful when talking about these stars' "luminosities." Their *total*, or "bolometric," luminosity ranges up to a few thousandths of the Sun's, but their *visible* luminosity is a ten-thousandth or less (Table 1). The reason is simply that so much of an RD's output lies in the infrared. For comparison, the difference between the Sun's bolometric and visual luminosities is only about 15%. *Most* of the Sun's output lies in the visible.

Bolometric magnitudes are hard to measure, too, and you'll find several different answers in the literature for how to correct the observed visible luminosity to the true luminosity. I estimated the bolometric luminosities in Table 1, as well as the actual stellar temperatures, using the results of the study by Kirkpatrick et al. (1993). These differ a bit—but not grossly so—from the correction values I quoted in my book *World-Building*. There are two reasons it's hard to measure bolometric magnitudes. First, for best results the spectrum needs to extend into the infrared, but IR spectra haven't been common till recently. Second, the atmosphere of an RD is cool enough that lots of hardy molecules can form, things like carbon monoxide (CO), titanium monoxide (TiO), and so on. The absorption bands from such molecules add a lot of complexity to the spectrum. (In fact, such oxide bands *define* spectral type "M.") They tend to hide the "blackbody" radiation from the star itself; that is, the radiation that the star puts off just because it *is* a hot body, and which we need to measure to get the temperature.

A digression: some years back ("Carbonosis", March 1993) I proposed that planets forming in stellar systems with high ratios of carbon to oxygen were bad bets for technical intelligence. Briefly, if carbon atoms outnumber oxygen in the nebula from which planets are condensing, no iron gets oxidized—and so no iron ends up in a planet's crust. It all ends up in the core instead, as iron metal. At the very least, even if intelligence evolves, having no iron in the crust will make it difficult to stumble across metallurgy. Furthermore, the planet's mantle can act as a "ocean eater" over geologic time, because its chemistry is such that it breaks down subducted seawater. (Technically, the mantle is too "reduced.") The result is that hydrogen, instead of steam, will spew out of volcanoes, there ultimately to be lost to space. This would be even

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

more awkward for an Earthlike planet!

The sheer abundance of type M dwarfs shows that this extreme "carbonosis" scenario is rare. In an M dwarf, all the carbon combines with all the oxygen to form CO, but since there's oxygen left over we get those metal oxides. There *are* certain red dwarfs, called "carbon stars" (spectral types R, N, and S) in which carbon *is* more abundant than oxygen, and then you get molecules other than oxides in the atmosphere (and the spectral types R, N, S depend on *which* molecules.). Carbon stars, however, are quite rare.

But a formal study has since appeared (Gaidos, 2000) that indicates that "carbonosis" can happen even if carbon atoms don't outnumber oxygen. And you saw it here first, in *Analog!*

In any case, the alleged "lurid light" of a "red" star is no reason for ignoring them.

There's a good reason not to ignore them, too: there are so *many* of them. Most of the stars in the Galaxy—in the *universe*—are red dwarfs. According to Heath et al. (1999), about 70% of the stars in the solar neighborhood are RDs. They extend from stars of about half a solar mass (M_{sun}), with >6.0% solar luminosity and an effective temperature around 3,700 kelvins, to stars at the threshold of "stardom," the minimum mass needed to initiate nuclear fusion reactions, about 0.08 M_{sun} or 80 Jupiters.

Tides and Locks

A better reason for ignoring the "red" stars, both in SF and in SETI scenarios, has been "tidal locking." Even though an RD is vastly less luminous than the Sun, its mass is not all that much less. It's still anywhere from about 10% to nearly 50% of a solar mass (see Table 1).

To get an Earthlike level of illumination, then, a planet around an RD must be proportionately far deeper in the star's gravity well. And this means the planet's spin has been vastly slowed by tidal forces from the star, just as the Moon was long ago locked into synchronous rotation with the Earth. Look at Table 1 again, where I've calculated the distance a planet would need to be from each star to get an Earthlike level of illumination. (Note that we must use the *bolometric* luminosity, rather than the visible-light luminosity, when calculating how far from its "red" sun an Earthlike planet must be. Obviously, the planet's total heating comes from its total illumination, not just from the part that happens to be visible light! Just as with an ordinary incandescent lamp, those infrared rays are good at heating things up, even though you can't see them.)

I've also shown the tide-raising force for a planet at that distance relative to the Moon around the Earth. As you can see, even an Earthlike planet around Barnard's Star, the biggest and brightest of the three listed, still "feels" over 4 times the tidal effect that Earth's Moon feels from Earth. So, all these planets will have been tidally braked; the conventional wisdom is certainly correct there.

But the tidal locking is not necessarily a show-stopper. For one thing, an Earthlike companion of a giant planet that in turn circles a red dwarf could have a reasonable day length. What happens is that the Earthlike planet would be locked to the giant planet instead. So, just as the Sun rises and sets on our Moon, even though it always keeps one face to Earth, the red sun would rise and set on the Earthlike companion, even though the companion would always keep the same face to the giant planet. Sure, this won't happen very often, but there are *so* many red dwarf stars it doesn't need to happen very often to make a big difference in the number of Earthlike planets. And certainly, over the last decade lots of giant planets have been discovered in close orbits to their parent stars. (Over the *very* long term, such orbits are still unstable to tidal braking: the planet's orbit around its primary slowly decays, so that the planet is even-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tually torn apart when it approaches the primary too closely. This will happen to our Moon in a hundred billion years(!) or so. The process is an issue for RDs simply because they *are* so extraordinarily long-lived, as I describe below.)

Robert L. Forward used another option in *Timemaster*, based on the case of Mercury in our own System. Although Mercury was once thought to show the same face always to the Sun (a setting used by lots of classic SF stories), it's in fact in a "3/2 lock"; it rotates thrice for every two revolutions around the Sun. So the Sun *does* rise and set on Mercury. (Synchronous rotation like the Moon's is a "1/1" lock; it rotates once for every revolution around the Earth, so that it always keeps the same face toward Earth.)

Presumably a Mercury-like situation could arise for an otherwise Earthlike world around a small RD. What's necessary for the 3/2 rather than the 1/1 lock to be stable is a modestly elliptical orbit, which Mercury has, and which is hardly an unlikely possibility for a near-in planet of another star. Again, this won't *always* happen, but it doesn't have to happen too often to make a significant difference in potentially Earthlike planets in the Universe. However, I've treated this scenario already in some detail in *World-Building*, so there's no point in belaboring it again here.[2]

Life and the Dark Side

Let's instead look again at that 1/1 lock. Such a state, with one face permanently facing the star and the other facing away, has seemed a very bad situation for a planet to be Earthlike. In fact, it's tended to get dismissed out of hand. It's been used in SF, though, right here in *Analog*. Stanley G. Weinbaum envisioned a tidally locked Venus in the 1930s ("Parasite Planet," February 1935, and "The Lotus Eaters," April 1935), and Poul Anderson ("Trader Team," July/August 1965) even envisioned a planet tidally locked to a red dwarf (or at least it's clear that's what he meant, although at one point the star is described as of spectral type K0.)

Weinbaum and Anderson, in fact, may have been on to something. A recent academic study suggests that planets in 1/1 locks (what these authors call "synchronously rotating planets," or SRPs) *can* support a roughly Earthlike environment under certain conditions (Heath et al., 1999). "Atmosphere collapse"—the freeze-out of all atmosphere onto the dark side, the way a cold trap in a laboratory vacuum line pulls out residual gases—turns out to be more easily forestalled than you'd figure. (Remember when Mercury was supposed to have oceans of such things as nitrogen on its dark side?) Heath *et al.*'s models indicate that a mere 100 millibars (mb) pressure of CO_2—a tenth of an atmosphere, near enough—ensures enough heat transport to the dark side to preserve the atmosphere. With 1500 mb of CO_2, and a total insolation of 0.8 Earth's, parts of the sunlit side can even support liquid water. Surprisingly, too, the surface winds are not extreme between the Day Side and the Dark Side, averaging only 5-10 m/s (about 10-20 mph), even near the terminator (the day-night boundary). Most of the exchange occurs in the jet streams aloft. (Airplane rides could be bumpy!)

For comparison, however, Earth's present atmospheric CO_2 level is about 350 parts per million (ppm), or a bit more than a third of a millibar, so it's substantially less than these values. On the Earth, too, the CO_2 content over geologic time is regulated by weathering of surface rocks, in the so-called "carbonate/silicate cycle." The overall stoichiometry is:

$CO_2 + CaSiO_3 <-> SiO_2 + CaCO_3$.

$CaCO_3$ is calcium carbonate, the main component of limestone. This is why

[2] Well, *get* a copy!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Earth has as much CO_2 as Venus does; ours, however, is nearly all safely locked away in limestone (see "On Building an Earthlike Planet," July 1989). So at least on an Earthlike planet it's not possible to add arbitrary amounts of CO_2 to the air. Over geologic time it just gets drawn down again.

Rather than worry about how to get a much higher CO_2 content on an active, Earthlike planet, though, Heath *et al.* noted that in any case the main greenhouse gas in the Earth's atmosphere is just water vapor. According to them, Earth's water-rich atmosphere is nearly equivalent to a pure 1000 mb CO_2 atmosphere, and so they do their models on that basis. They find that the temperatures at the subsolar point—um, subs*tellar* point, the point directly underneath the unmoving sun—exceed 50°C (122°F), which is warm, but not unreasonably so. The temperatures fall away from the substellar point to reach 0°C somewhere around the terminator. So there will be a good-sized temperate zone.

What might such a planet be like? Well, there are no seasons, at least in an Earthly sense. Our seasons, of course, come from the Earth's axial tilt: when one pole is tilted toward the Sun, it's summer in that hemisphere, while it's winter when the pole is tilted away. However, the pole of a synchronously rotating planet will be upright, so that unmoving sun will always be shining from the same point in the sky. Of course, if the orbit's at all elliptical, there will be some variation in heating over the course of the planet's "year"—but the year is only a week or two long (Table 1)! That hardly counts as a season.

Nonetheless, all is not so boring as it seems. Obviously the star will be a lot larger in its sky than our Sun—around 2 degrees across, versus half a degree for the Sun (Table 1). So equally obviously, area for area, the surface is dimmer than is our Sun. When you then consider that most of the radiation coming off each square centimeter of the star's surface is infrared, the sun is very dim indeed—at least by comparison with our Sun. You could look directly at (say) Proxima from an Earthlike orbit, at least briefly.

And that's interesting because the star itself is going to be much more interesting to look at than the Sun. Sunspots are (proportionately) much bigger and could even cause a significant dimming in the brightness, perhaps as much as 40% over periods of weeks. Because the star is (relatively speaking) so cool, the molecules in its outer layers might even condense locally, clouds of refractory oxides freezing out like ice crystals in the Earth's atmosphere. You might be able to see brighter and darker areas across the stellar surface due to the changing "cloud cover."

Most spectacularly, many RDs are "flare stars." Every now and then they shoot off a huge flare and increase their luminosity by as much as 100 times—which, of course, could be awkward indeed for a habitable planet. The planet will need a thick atmosphere and ocean as a buffer to moderate such occasional pulses of heat—but it needs that anyway to forestall atmosphere collapse. Flares could be particularly threatening for local life forms because they put out much more ultraviolet than the star radiates normally.

Flaring seems to be related to rapid stellar rotation, though, so as the rotation rate decays over geologic time, it may no longer be an issue by the time higher life forms evolve. Nonetheless, "stellar weather" is going to be a major source of climatic variability on an RD's planet. Perhaps an indigenous priesthood observes the star continually for hints as to what the future holds, for crops, floods, and so on. Poul Anderson used much this idea in another of his Polesotechnic League stories ("Territory," June 1963).

Over geologic time, assuming active plate tectonics like Earth's, massive ex-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tinction events—and spectacular recoveries therefrom—will occur as the continents move in and out of the dark side. In fact, a continent's transit through the dark side will look like an "ultra-glaciation." At least for a while, the geothermal heat leaking out of the planet will keep the oceans from freezing all the way to the bottom during such transits. Ultimately, though, as the planet loses its internal heat its tectonics will stop—and then the oceans *will* freeze up completely. Trillions of years is ample time for all the original complement of long-lived radioactive elements, which play such an important role in driving tectonics on the Earth, to decay away completely (see "Refueling a Rundown Planet," August 1991).

But that's a long way off yet. Maybe a trip to Barnard's Star or Wolf 359, instead of (say) Tau Ceti, is not such a dismal alternative after all. (I'll sign up!)

Only a Trillion Years. . . .

RDs have a huge advantage if you take the long view, too. They're *extremely* long-lived. That's, of course, a consequence of their low luminosity. They're exceedingly miserly with their hydrogen fuel, with the upshot that they'll last far longer than the Sun—even, for the smallest, over ten trillion years. That's over 650 times the present age of the Universe. Moreover, for most of their lives RDs are "completely convective" in their internal structure. That means the star stays thoroughly mixed, with the result that a much higher fraction of a star's hydrogen content will be available as nuclear fuel than for the Sun. When all the bright stars have long since dwindled to unprepossessing white dwarfs, the RDs will still be calmly shining, scarcely changed.

Or rather, maybe a bit changed. At present, hydrogen fusion in a very-low-mass star isn't quite the same as in a more massive star like the Sun. To be sure, it starts out the same: two protons (hydrogen nuclei, ^1H) fuse into a deuteron (deuterium nucleus, ^2H):

$$^1H + {}^1H = {}^2H + e^+ + \text{energy}$$

where the "e^+" is a positron—an anti-electron—that carries away the extra positive charge. Sooner or later it mutually annihilates with an electron to release even more energy. Later, this deuteron acquires another proton to become a nucleus of helium-3 (^3He):

$$^2H + {}^2H = {}^3He + n\ (\text{neutron}) + \text{energy}$$

or,

$$^2H + {}^2H = {}^3H + {}^1H + \text{energy}$$

Since tritium (^3H) decays to ^3He with a half-life of only about a dozen years, the end result is the same.

In stars like the Sun, one more step occurs: two ^3He's fuse into a ^4He, with a couple of protons left over:

$$^3He + {}^3He = {}^4He + 2\ {}^1H.$$

Present-day RDs, though, stop at ^3He; their cores aren't hot enough to go on to ^4He. The reason is that electrostatic repulsion between the two ^3He nuclei requires a lot more energy to overcome than that between two protons.

(As an aside, ^3He fusion has attracted interest as a potential fusion power source on Earth, because it's in theory a lot cleaner. Note that the by-product is 2 protons, which won't tend to make the surroundings radioactive the way by-product neutrons will. Unfortunately, ^3He is almost completely absent on Earth; the helium out of gas wells is nearly pure ^4He, because that helium originated as alpha particles from uranium and thorium decay. Helium-3 is slightly enriched on the Moon's surface from solar-wind implantation, and that's a proposed incentive for lunar development. Unfortunately, even if we had a source of ^3He, we *still* don't know how to do controlled fusion with it.)

So, as an RD shines away, ^3He accumulates in it . . . and you might expect

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

that that ^{3}He will eventually "burn." Stars tend to burn hotter and hotter over their lifetimes, because as the more massive fusion products accumulate in the core they raise the pressure. In turn, the raised pressure causes the nuclear reactions to proceed more efficiently. The Sun's luminosity, for example, has increased about 30% since its formation, according to current astrophysical models. Eventually, too, the Sun will become a "red giant": conditions in its core will become intense enough that it will become able to fuse three He-4's into a carbon-12. At that point, some 5 billion years from now, the Sun will have swollen greatly and cooked out the inner System completely.

Sure enough, RDs do something similar, but not nearly so spectacularly. A group of researchers (Laughlin *et al.*, 1997) has modeled in some detail the evolution and ultimate fate of RDs ranging in mass from the lower stellar limit near 0.08 M_{sun} to 0.25 M_{sun}. According to their calculations, a 0.1 M_{sun} star begins with a temperature of 2228 K and a luminosity some 0.04% of the Sun's, and not much happens for a trillion(!) years or so. At about 1.4 trillion years (Ty) of age, the mass fraction of ^{3}He has risen to its maximum value, almost 10%. The star hasn't changed much outwardly, though: its temperature has risen to just under 2400 K and its luminosity to about 0.06% solar. For the next 2.5 trillion(!!) years, ^{3}He is steadily consumed. By 3.05 Ty, ^{4}He dominates the mass; the temperature is now about 2500 K and the luminosity has risen to some 0.1% of solar.

A "critical juncture" occurs at 5.74 Ty, when the temperature is 3450 K and the luminosity not quite 0.3% solar. Hydrogen now makes up only 16% of the star's mass, and the structure changes abruptly because now radiation can get out more easily (or, in the language of physics, "radiative transport" now dominates "convective transport.") By comparison to its languid youth, the star now starts living at a breakneck pace: it reaches a maximum luminosity of around 0.63% solar, and a temperature of 5400 K, only a matter of a few hundred billion years later. Its maximum temperature, 5800 K (hotter than the Sun!), when its luminosity is about half a percent of the Sun's, is reached a mere 400 billion years after that critical juncture. Now the star begins to cool off, eventually becoming a "helium white dwarf" after having converted nearly 99% of its original hydrogen into ^{4}He—a remarkable efficiency. The total "hydrogen burning time" has lasted something over 6 trillion years. (The usual white dwarfs in the present Galaxy are composed of carbon-oxygen-nitrogen, the debris left behind by a red giant. A few He dwarfs are known at present, though; they're all part of a binary system, and have been prematurely aged by the companion star's stealing away much of their mass.)

Red Giants and Late Bloomers

That last breakneck 400 billion years represents a curious kind of star, a type G that has only 1% or so of the Sun's luminosity. Such stars don't exist now, as there hasn't been nearly enough time for such highly evolved red dwarfs to evolve. Laughlin *et al.* suggested that such "late bloomers" might spawn life on their newly thawed outer planets, which had previously lain in deep freeze for trillions of years. There should be plenty of time: after all, the total duration of the star's "last gasp" is some 90 times that of the Earth's present age!

A problem these authors didn't mention, though, is that those newly thawed planets will be tectonically dead: no plate tectonics, no volcanoes, no nothing. Again, trillions of years is plenty of time for planets to lose all their internal heat sources. This makes them considerably less promising as "abodes of life"—at least for higher life forms.

Laughlin *et al.*'s calculations indicate that stars with masses somewhat greater

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

than 0.1 M_{sun} evolve similarly, except that the "late bloomer" stage is both more dramatic—i.e., hotter and more luminous—and happens sooner. In fact, in a transition region from about 0.16 to 0.2 M_{sun}, the "bloomer" phase starts to look more and more like a red giant, in that there's a sizable increase in luminosity and swelling of the star, although helium fusion never occurs. The minimum mass for a red-giant phase to occur seems to be about 0.25 M_{sun}—after a trillion or so years of fusing hydrogen. Barnard's Star seems to lie right at this limit (Table 1).

Retirement Homes of the Gods . . .

All in all, then, that overwhelming multitude of type M dwarf stars just might be good real estate after all. If nothing else, they'll be retirement sites for long-lived civilizations. (Humans can hope they're among them.)

References:

Gaidos, Eric J., "A Cosmochemical Determinism in the Formation of Earth-Like Planets," *Icarus*, *145*, 637-40, 2000.

Gillett, Stephen L., *World-Building*, Writer's Digest Books, 1996.

Heath, Martin J.; Doyle, Laurance R.; Joshi, Manoj M.; Haberle, Robert M.; "Habitability of Planets Around Red Dwarf Stars," *Origins of Life and Evolution of the Biosphere*, *29*, 405-424, 1999.

Kirkpatrick, J. D.; Kelly, Douglas M.; Rieke, George H.; Liebert, James; Allard, France; Wehrse, Rainer; "M Dwarf Spectra From 0.6 to 1.5 Micron—A Spectral Sequence, Model Atmosphere Fitting, and the Temperature Scale," *Astrophys. J.*, *402*, 643-654, 1993.

Laughlin, Gregory; Bodenheimer, Peter; Adams, Fred C.; The End of the Main Sequence, *Astrophys. J.*, *482*, 420-32, 1997.

About the Author:

Till recently, Steve Gillett was a research professor at the Mackay School of Mines, University of Nevada, Reno, where he'd worked on Paleozoic paleomagnetism, lunar resources, and seismic risk at Yucca Mountain, Nevada, the proposed high-level nuclear waste repository. He also taught intro geology classes including one on planetary geology. He is now involved in several start-up ventures on applications of molecular nanotechnology in environment and resources. He has a white paper on this topic online at the Foresight Institute (www.foresight.org). Gillett has a B.S. in geology from Caltech and a Ph.D. from SUNY Stony Brook.

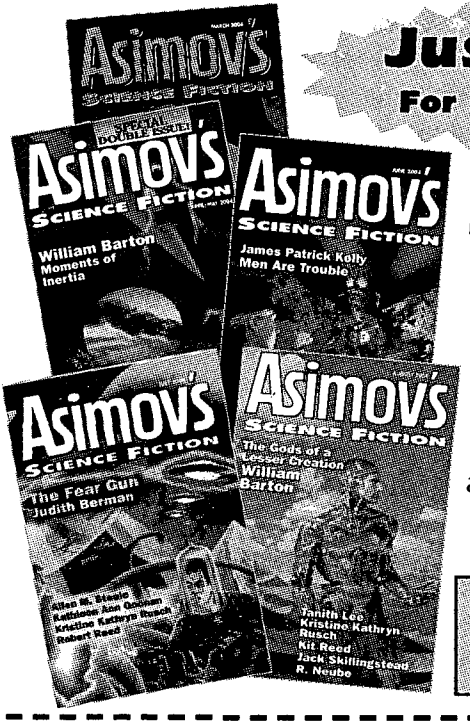
MOVING?

Please send both your old and new address (and include both zip codes) to our subscription department.

Write to us at: *Analog Science Fiction*, Dept. NS, 6 Prowitt St., Norwalk, CT 06855-1220. Or on our website:www.analogsf.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

DISCOUNT TIME TRAVEL



Just $6.95!
For 5 Classic Issues

Order our **Asimov's Science Fiction Value Pack** and you'll get 5 of our most popular back issues for just $6.95 plus shipping and handling. **That's 65% off the regular price!**

Enjoy novellas and short stories from the leading science fiction and fantasy writers. Plus, candid, no-holds-barred book reviews and guest editorials.

To order,
just fill out the coupon below and mail with your payment today.

DELL MAGAZINES
Suite SM-100, 6 Prowitt Street, Norwalk, CT 06855-1220

☑ YES! Please send me my Asimov's Science Fiction Value Pack. I get 5 back issues for just $6.95 plus $2 shipping and handling ($8.95 per pack, U.S. funds). My satisfaction is fully guaranteed! My payment of $_____ is enclosed. (IAPK05)

Name: _____ (Please print) _____

Address: _____

City: _____

State: _____ ZIP: _____

Please make checks payable to Dell Magazines Direct. Allow 8 weeks for delivery. Magazines are back issues shipped together in one package. To keep prices low we cannot make custom orders. Add $4 additional shipping and handling for delivery outside the U.S.A.
Offer expires 9/30/06.

35C-NN5VL1

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

911-Backup

Richard A. Lovett

There's a fine line between a tool and an addictive drug. . . .

Winston was on the Sunset Highway when it happened. He'd just crested the Sylvan Hill, where the freeway, living up to its name, lined up directly on the late-afternoon sun. He squinted, winced, and reached for the visor, but at the same time, he reached out with his mind, as though trying to wipe the sunbeams out of his eye with the swipe of a mental cursor.

It was an obvious fantasy wish, and the safeties should have ignored it. Instead, he had an odd flickering sensation, as though crossing from one reality to another—sort of like a mental hiccup. It wasn't the fist time he'd had such a sensation, and he'd been meaning to have it checked out—just as he'd been meaning to do something about the shimmy his car sometimes produced when downshifting from fourth gear to third. But always before, the hiccup had passed as quickly as it appeared, and he'd never quite gotten around to doing anything about it.

Now, he had about five seconds to realize he'd waited too long. While he was still reaching for the visor, the sun zipped across his field of vision and disappeared, like a computer icon summarily hauled into the trash.

That's weird, he thought. *How did I do that?* Then the spot where the sun had been turned lavender and exploded into fractal patterns, highlighted by flickering zigzags, like chartreuse lightning bolts.

"What the hell!" Winston yelped. Followed by "Crap!" as he realized that the lane markers ahead of him were shimmering with those same unnatural hues. Any moment now, the rush-hour traffic was going to start looking about as much like the normal commute as the sky looked like—well, anything sky should look like.

Winston stomped on the brake and steered for the shoulder. Car horns sounded on all sides, then mutated into

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

swarms of musical symbols that flew across his field of view like startled birds. Could he still hear them, or were his vision and hearing now cross-wired?

Other than desperately trying to get to the shoulder alive, Winston had one overwhelming thought. *I need an uplink, NOW.* His laptop had a microwave card and a link coupling, but those were in the trunk, and he didn't think he had time to reach them. Even as the car was rolling to a halt, he grabbed his cell phone and jammed its hands-free plug into the link jack in his right temple. Luckily, he'd spent the bucks for the universal telecom implant, though his reasons for doing so hadn't been practical. The gilded *fleur-de-lis* was a fashion statement—a nice way to tell the ladies that you had money to burn. It had bought him some really great dates in the years he'd been living alone, though the only woman who'd ever been worth keeping around was the one who'd *not* been attracted by his father's money and had eventually left him.

The phone jack snapped reassuringly into place, but Winston's increasingly scrambled brain refused to run the auto-dialer that should have had him instantly screaming for help. He grabbed the keypad, and for a horrible moment, even his wetware—the largely intact remnants of the brain he'd been born with—refused to cough up the number for the emergency server. Then he had it: 911-BACKUP. Too many digits; 911-BACK would do, though you had to dial fast to avoid getting the police. No problem with that. By now, Winston was in full panic mode.

But even as he tried to figure out which pieces of data were the most crucial, he knew it was too late. There was so much data it felt as though he was trying to pour his entire soul through the phone link. And the phone was so, so *slow*, especially here on the far side of the Sylvan Hill, where cellular service was always dicey, at best.

Winston's final thought, as chartreuse snow ate what was left of his vision and invaded the rest of his consciousness, was that he was really, really glad he'd also spent the bucks for the extended warranty on his e-Brain implant.

He awoke in a hospital bed. The chartreuse snow was gone, and his hearing and vision seemed normal. He had a bit of a headache, but nothing severe, and none of that disorienting sluggishness you get coming out of a sedative. It was like waking up from a nap except that instead of feeling refreshed, he felt vaguely diminished. More than vaguely, he realized, as he played back the events that had brought him here. He could remember every detail of the system crash that had taken out his e-Brain, but he couldn't recall why he'd been on the Sunset Highway in the first place. Going somewhere, obviously, but where? Try as he might, he couldn't remember.

Winston studied his surroundings. The first thing he noticed was that he was free to move his arms and legs. He wasn't even tethered to an IV, although a monstrous cable snaked from his temple jack, up and over the headboard of the bed. The next thing he noticed was that the room didn't look like any hospital room he'd ever seen before. There were no windows, no nurses, none of the doctor's-office rubbing-alcohol smell which, as a kid, had always set his heart to hammering with fear that he was about to get a shot. Instead, there were banks and banks of electronic equipment, a rat's nest of cables, and two young men in stained T-shirts that looked like they'd never pass the sanitary code of a hospital in even the poorest corner of the planet. Wherever that might be. Winston was a patron of dozens of trendy liberal causes, but suddenly, he couldn't name a single crisis-wracked nation, let alone one in

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

which these two gentlemen would *still* be out of place. Worse, he couldn't even conjure up his own address, though he did know he was a registered voter of Washington County, wherever *that* was.

The two men—techs, he presumed—were huddled over a monitor, muttering things to each other that Winston suspected would be gibberish to him even if he *could* remember everything he'd once taken for granted. Both had e-Brain links gleaming near their ears, but neither was currently jacked in.

Suddenly, Winston felt very much alone.

"Where's Kathy?" he asked.

The techs jumped, and Winston realized that whatever they were doing, they weren't monitoring his current condition, or they'd have known he was awake.

"Sorry," he said. He'd not meant to startle them. Still, he was proud of himself for not asking any of the obvious waking-up-in-a-hospital questions, such as *where am I?* or *what happened?* He'd get to those eventually, but for the moment he wanted the comfort of the woman he loved.

"Who?" one of the techs asked, swiveling to face Winston. No *welcome back* or *how are you feeling?* But whoever heard of a computer tech with a bedside manner? This one's shirt said "Beam me up, Scotty," and looked as though it had been beamed through a lot since the last time it had been washed. The man himself was thin and wispy looking, with a patchy beard that seemed to have lived an even more difficult life than the shirt. Oddly, Winston felt reassured. If they let this Mutt and Jeff pair play with all that expensive equipment, then these guys must be brilliant indeed. Right now, Winston felt that his own IQ was hovering in the vicinity of minus ten. Not that it had been anything to boast about when he was fully linked. His father had been the genius; Winston was best at rationing out the money in his trust fund and holding down the family honor at social gatherings.

"Kathy," he repeated.

The other tech poked at a keyboard. "C or K?" he said without looking back.

This man was as broad-shouldered as his companion was scrawny. His shirt was jet black, and its backside said something incomprehensible about clone soldiers and black holes. A rock band, or a literary reference? Winston suspected that without a good uplink and some serious web searching, he'd never have been able to figure that one out, either, even if his implant was still functioning, which obviously it wasn't. "Huh?" he asked, staring at the shirt.

The broad-shouldered tech twisted in his chair, revealing ample belly and a partially eaten hamburger resting near a keyboard. "I said, is it Cathy with a C or Kathy with a K?" he repeated, as though talking to a child.

"Oh," Winston said, reassessing his own IQ to minus twenty. "With a K."

A keyboard rattled and the two techs studied the screen. "Oh-oh," scraggly beard said. "Years ago, he was married to someone named Kathy."

Clone-shirt was studying another file. "Damn," he said. "I think he had the implant installed before the divorce. This is bad. Really, really bad. Why the hell don't these guys ever back up important stuff like that?" Then he tapped another key and Winston fell instantly back to sleep as though someone had shut off the lights.

The next time he woke, he had a whole army of techs, some of whom were actually wearing white lab coats. The room, if it was the same one, seemed to have sprouted even more equipment, and this time the techs were watching him, as though waiting for him to come back to life.

Asking for Kathy last time had been a mistake, although he wasn't quite sure

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

he understood why. There was bad news hiding there somewhere, but he'd only had a few seconds in which to process it. All he knew was that Kathy should be here. Was she out of town for a few days? Why couldn't he remember anything recent about her—such as where she might have gone? On the freeway, he'd not even thought of calling her for help. Why on Earth not?

It was safer to stick to clichés. "What happened?" he asked, but nobody answered.

"Read this please," one of the whitecoats said, shoving a printout into his face.

His bifocal-replacement software apparently wasn't in any better shape than anything else, but even when he pulled back far enough that he could focus on the paper without image enhancement, it didn't help. He might as well have been trying to decipher Egyptian hieroglyphics. Which he once could have done with the implant and an uplink.

"Sorry," he said. "What language is it?"

"English," she said, taking back the paper. "Actually, it's the alphabet. Do you at least know what that is?"

"Sure," he said, but when she asked him to recite it, he couldn't, even when she prompted him with a little jingle whose tune he knew by heart but whose words mostly eluded him. "Da, da, da, dah, E, F, G," he sang triumphantly the third time. "Da, da, da, da, ellemmennohpee." He smiled proudly, but the tech looked concerned. "Damn," a voice behind her muttered. "I hate this job. You'd think that if they weren't going to take the time to back up, they wouldn't shove essential skills from wetware into firmware. Why the hell do they do that?"

"Shhh," said another voice.

But Winston knew the answer to that one. The e-Brain was a wonderful device, but it was frustratingly literal. The organic brain was intuitive, better able to react to emotional needs. Winston had a passion for '80s music, and he'd been freeing up organic memory for song lyrics. At parties, he was always the one who knew the perfect lyric for any occasion. It was another great way to impress the ladies—which explained why he'd never viewed the alphabet song as worth keeping in organic memory: because that one wasn't going to impress anyone over the age of consent. Recently, he'd been expanding his inventory to '90s music, in an effort to draw the attention of a younger generation of ladies. Although why he'd wanted to do that when he had Kathy eluded him. He was just beginning to connect that incongruity to Mutt and Jeff's comments about "the divorce" when the lights went out again.

The third time Winston woke up, the giant cable was no longer snaking out of his head. A tech was still holding it, so he must only recently have been unplugged. Other people were standing at the foot of his bed, surrounding a middle-aged woman whose gray-streaked hair was pulled back in a severe bun.

Winston tested his memory. "Where's Kathy?" still drew a blank, though he had a bad feeling he now understood why. The rest of his life wasn't much better. Winston could remember that his father had made his fortune as a molecular biologist, working for a company that made AIDS vaccines from genetically engineered yeast. He'd never really understood the process—never particularly wanted to. But when he tried to pull up even the basic social chitchat details, the type of stuff you *had* to know about the family business if you didn't want to appear a fool on the cocktail party circuit, all he could recall was it had something to do with DNA—which sounded like the name of an alt-rock band, but not one he'd ever

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

heard of. Obviously, the implant wasn't yet fully restored.

The woman at the foot of his bed looked like a honest-to-goodness doctor, but instead of a white coat and stethoscope, she was dressed in a blue blazer and wore a pricey microwave uplink. The throng gathered around her were younger, reminding Winston of vids in which med students followed senior physicians on rounds. Did doctors really do such things? If he'd ever known, he no longer did. Of course, this woman was probably an implant specialist, not a doctor. Presumably, her groupies were techs-in-training.

The woman was telling her protégés about the Sunset Highway, the Sylvan Hill, and Winston's panicked call for help, all of which he remembered far too well. Momentarily, he tuned her out for a system check. He was relieved to find that he had a functioning implant, but when he tried to inventory his hard drive, he discovered that it contained nothing but the operating system. The rest was a huge blank—a gazillion-quad *tabula rasa* waiting to be filled. How and with what, he had no idea. Maybe it was time to listen to Dr. Blue Blazer.

"His quantum drive had a hole in it," she was telling her pupils. "Luckily, his gray matter is intact, but the device was slag. And unfortunately, he used his wetware mostly for trivia. For example, his wife left him twelve years ago, but he apparently stored all those memories on the drive. As far as he remembers, they're still newlyweds."

"What about backup?" someone asked.

"You tell me. It's on the chart."

"He scheduled one appointment, a few weeks after he got the drive," a third voice said. "But he failed to show up, and never rescheduled. That's not uncommon. Most people never back-up. This guy's only attempt was the one he made from the freeway, on his cell phone. We got a couple of files from it: something that looks like an address book, and that morning's stock market quotes, which he'd apparently downloaded from the *Wall Street Journal*. Unfortunately, he no longer knows how to read or do math, and both files are in text mode, so they're unusable until he's reeducated. Although I suppose he could have someone read them to him, so he could refile them in auditory mode."

"What's the prognosis?"

"The lost data's gone forever. The device was under warranty, but the warranty excludes data. Still, the company should try do what it can to make him a functioning member of society. But it won't be easy."

Winston cleared his throat. "Why not just download a reading program onto my new drive?"

For the first time, the older woman looked at him, rather than at her students. If she was embarrassed at being caught discussing him so clinically, she gave no sign. "Ah," she said, "you're awake."

She turned to face him more directly. "We could do that if you'd been properly backed up," she said. "But there's no such thing as a one-size-fits all reading program. We all learn to read in our own way, and yours is gone. It's kind of like you lost a piece of your personal operating system. Several pieces, actually. We've been running brain scans while you were asleep, and you not only can't read and write, there are a lot of other things you can't do, either. At least your motor skills are intact. We once had a baseball player who got konked on the head by a fastball that cracked his drive unit. When we replaced it, we discovered that he'd not only placed all of his pitching skills on it, but he'd put a lot of others there as well. At least you can still walk."

She turned back to her students. "Feel free to ask him questions, but be gentle. How many of *you* remember to back up every day?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

* * *

Winston shifted uncomfortably in the tiny seat. There was barely room for his knees beneath the hard wooden desk, and every time he moved, he rubbed another wad of stale chewing gum off its underside onto his slacks. He was humming to himself, trying to assemble a list of great pogo-dancing tunes for tonight's date with Linda, when a door opened and a fortyish women walked in, conservatively attired in cardigan and slacks. Not Winston's type at all. It wasn't that she was too old—it's just that he liked them a bit more flamboyant. Besides, she was married.

"Good morning, Mrs. Armstrong," Winston intoned, along with a roomful of higher-pitched voices. Waiting for Mrs. Armstrong, he'd tried to count how many there were, but lost track when he ran out of fingers and toes.

"Good morning, class." Mrs. Armstrong walked to a desk at the front of the room and sat down. "Today we're going to study the alphabet."

Earlier, she had apologized for the tiny chair. "We're looking for something more suitable," she said. "A couple of weeks ago, I graduated two other e-Brain rehabs to the second grade, and they took their chairs with them. I've been trying to get the principal to either buy some new ones or loan us the visitor's chair from her office, but so far I haven't had much luck."

That, of course, was something Winston could fix on his own. He still had plenty of money, although it was now controlled by a court-appointed guardian. Still, he ought to be able to get the trust to buy him a decent chair. After all, it was a private school, and they were already paying heaven knew how much in tuition. Winston had seen the number, but it didn't mean anything. Hopefully it wouldn't be too long before he could read the bill and again understand such things. The only thing he knew for sure was that private tutoring would cost much, much more—more than the trust fund could handle indefinitely.

Nobody really knew how long his rehab would take. It depended too much on precisely what skills were missing. His vocabulary seemed intact, his reasoning skills were unaffected, and as long as the topic was music, he was as witty as ever. What he couldn't do was read, write, or do arithmetic. And other than all those song lyrics, he seemed to have lost a lot of basic facts.

Recently, he'd been told, an e-Brain rehab patient had made it all the way through high school in three years. But he'd slowed down in college, and would probably be at retirement age before he got back the Ph.D. he'd once held in Twentieth Century French literature. Winston would be content with regaining a junior-college level of proficiency, and hoped to set a new speed record en route.

Meanwhile, the class was singing the alphabet song. "A, B, C, D, E, F, G," Winston chimed in. "H, I, J, K, L, M, N, O, P." He paused. What came after P?

"Q," said a six-year-old voice beside him. Even at his tender age, the boy's temple had the gilded *fleur-de-lis* of an e-Brain jack, although currently he was working solely on the internal unit.

The boy grinned and leaned conspiratorially toward him. "It works a lot faster if you just store it all in the 'puter and don't try to memorize it," he said. "That way you always get it right the first time. My dad says I could learn everything just by surfing the net, but my mom won't let me."

The class had reached Z and was starting over. Mrs. Armstrong was on the far side of the room, comforting a girl who was crying because she'd stumbled over D.

The boy caught Winston's glance one more time and gave a very adult roll of the eyes. "I mean, who *cares* about all of this stuff?" he said. ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Case of the Contumacious Qubit

Thomas R. Dulski

You never know where a purely routine task may lead—especially if you get mixed up with someone like Baker!

I can't say that I was overjoyed at forced retirement at 59 1/2 years of age. I had given nearly three decades of reasonably dedicated service to the research laboratory of Monash Chemical, a small-cap niche-market manufacturer of bulk specialty chemicals. Over that span I'd obtained a few patents and published some technical articles; I had even seen some of my work make a sizeable, albeit short-lived, profit for the company. True, I had had to endure an onerous burden of lab politics, corporate policy fads, and humiliating performance appraisals by fatuous, and often captious, young MBAs. But the work had been interesting for the most part, and I had fully expected to continue there until mandatory retirement at age 70.

But it was not to be. The world economy had once again yielded to unseen forces and cloaked interests and the general call was for another up-tick to even higher levels of productivity—read: work force reductions.

And so there I was in suburban Philadelphia with rather more time on my hands than I was accustomed to, and with a bit more marital togetherness than either my wife or I were fully comfortable with. Marcia had been a good deal more shocked by this development than I. And now that the initial reaction had subsided she had taken to leaving the newspaper open to the job listings. While I explained to her that I didn't feel particularly challenged by an opportunity to collect shopping carts in a strip mall parking lot, the objection did not seem to impress her. My pension was not lordly, but we were hardly

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

in desperate straits. Yet Marcia rarely missed an occasion to point out some octogenarian delivering newspapers.

I was paging through a copy of *Consulting for Dimwits* and musing over my plight one morning when the phone rang. It was a fellow named Carstairs that I knew from professional society meetings. It seemed that he was an organizer for a local student science fair in New Jersey. The event was to be held at a small college in a few days time and they were short of judges. Word had gotten to him that I had recently been shown the door at Monash and would I consider coming up for a day or two to judge the senior chemistry exhibits? It was a bit of a drive, but I was feeling the need for *lebensraum* at this point so I rather hastily accepted.

The following Monday morning, throwing together a one-suiter of assorted clothes, I announced to Marcia that I'd made some professional contacts about a consulting assignment and would be out of town for a few days. I'd take the Sentra and leave her the van.

I used my AARP card to obtain a reasonable rate at a clean but modest motel near Ptolard University. The soda vending machine in the hallway was out of order so I settled for a glass of ice water and fell asleep watching the Weather Channel.

The next morning I breakfasted on a bowl of oatmeal at a nearby restaurant and walked to the college gymnasium, which had been transformed for the science fair. What seemed like acres of canvas had been laid down to protect the polished hardwood floor of the basketball court. Row upon row of folding tables had been set up, each covered with brown wrapping paper upon which sat a sea of science fair exhibits. I noted that each exhibit space had been marked with cryptic alphanumeric codes. And the long rows of tables had each been decorated with large banners declaring categories like "Seventh Grade Junior Science" and "Senior Biology."

As I entered this arena I noticed only a scattering of individuals nosing among the exhibits, but there seemed to be a large gathering at the far end of the hall, beneath one of the retracted basketball backboards. From that general area I perceived the aroma of freshly brewed coffee. I quickened my pace past the empty bleacher seats, noting that the main attractant appeared to be several large boxes of donuts of various styles and flavors. Arriving in the queue I poured a cup from one of the urns, doctored it with powdered creamer, and reached toward a cream-filled pastry.

"Very bad for the low density lipids, Woodside. I suggest the whole wheat."

It was Baker, a man whom I had not seen for twenty years. I was transfixed for a moment, regarding this visage from the past. He was a bit gray now but otherwise pretty much identical to my very vivid memory of him: tall and thin, almost gaunt one might say, somewhat sallow of complexion with an aquiline nose, thin lips, and with a decidedly redoubtable air. Some might say that he radiated a dignified, professorial aspect. Except that I knew him for a fact to be nuttier than the proverbial walnut grove.

Upon graduation from college—more years ago now than I care to remember—I had accepted a position as Dr. Oliver Wendell Baker's special assistant in the firm, Baker Associates. It had entailed hours of drudgery, a little forensic lab work, and several hair-raising adventures. The man believes himself to be . . . well, let that rest for now. But after five years of that I had sent out a number of resumes and had landed the position at Monash. However, that hadn't prevented him from embroiling me in a particularly dangerous case involving a chemist's money cache and another humiliating encounter at a landfill in Lancaster, Pennsylvania. Over the following years, time had dimmed those experiences, but I had never quite lost

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the somewhat distracting thought that our paths might cross again. It was not that I disliked the man, but my affection was rather like that for a loony uncle whom you would rather not introduce to the neighbors.

I must confess that I stammered a bit as I grabbed for the whole wheat. "Baker—somehow, I would never have expected to see you here." I gestured, falteringly, with the donut. We shook hands amid a small cloud of powdered sugar and I quickly explained my current situation.

Baker sniffed and looked about the large room. "Actually, I have been engaged here on more than one occasion. Naturally, I fully condone the encouragement of youth in the path of science. Although, I must say that I don't always agree with the circus atmosphere of competition." He sipped at a plastic cup of steaming tea. "However, today I am here on business. I expect to meet a client here this afternoon."

"A teacher?"

"No, actually a student. A high school student named Randal Biederbeck who left an urgent message at my e-mail address."

I bit into the donut to cover my surprise. "You have an e-mail address?"

"A hyperlink from my website. Really, Woodside, you don't imagine that one in my line can afford to turn their back on the times." At this point Baker adjusted his deerstalker cap. "Come along, old fellow, and let's see what sort of exhibit this young man has come up with."

It was useless to protest and I began to dutifully follow my former employer. Beset with familiar feelings—a *déjà vu* of being sucked into a Charybdis of involuntary involvement—I took furtive bites from the donut.

We passed a myriad of student science exhibits as I scurried to keep pace with Baker's long strides. As we walked I noted several recurrent themes with only minor variations: commercial consumer product comparisons, electrochemistry, and cultural folklore seemed most prominent. There was: the onion-slices-floating-in-pools-of-mouthwash *leitmotif*, the grape-juice-stained-cloths-treated-with-assortments-of-laundry-detergents refrain, and the potato-or-lemon-or-whatever-battery lyric. And then there were the interrogative titles, hand-lettered or computer-generated across the top of the pasteboard displays: "Which Metals Corrode Faster?," "Does Music Help Plants Grow?" (tomato seedlings in paper cups), "Which Paper Towel Absorbs Best?," "Is the Polymerase Chain Reaction the 'Key' to Public-Key Cryptography?" This last title brought me up short, and, in fact, it was exactly where Baker had stopped to await me. He jerked a thumb over his shoulder. "Interesting theme, eh, Woodside? And this student is our—I mean my client."

Before leaving home I had read the multi-page e-mail attachment that Carstairs had sent. The students were to arrive at 1 PM, but great pains were taken to avoid any suggestion of bias by the judges. The judging rules had emphatically stated that the students' names were not to be used or associated in any way with their projects throughout the judging process. All projects were assigned an identifying code number by the science fair administrators. "Your client, this Randal boy, told you the title of his project, then?" I offered.

Baker drained his plastic teacup. "Not at all, Woodside. I merely deduced the topic he would choose from the communication he sent. Would you care to see it?" He retrieved a printout from his coat pocket.

I unfolded the paper and read:

"Hi:

My name is Randy (Randal) Biederbeck. I saw your cool website (neat graphics and I dig the weird violin music!) and thought you could help me. My Great-Aunt Hypatia is a neat lady who has been helping me with math

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and science and stuff, you know? See, I'm in high school and she's like a professor or something at a college. She got me stuff and showed me how to work some of the equipment in her lab. She got me that Kary guy's book and a bunch of magazine articles and she checked my spelling for the science fair project. Only now she left her job, really sudden like. She said that she was going to be gone for a while, only it didn't sound like her. Funny like, you know? So I'm worried about her. It's been over six weeks now and nobody's heard from her. Mom says not to worry, that her sister has gone off on her own like this before, but this doesn't feel right to me somehow. I know she's a flake and all, but could we talk about it? I'll be at the Newark Science Fair on Monday. I'll be wearing my purple riboflavin tie. Mom says I've got to wear a tie.

Sincerely,
Randy Biederbeck"

I took rather long to hand back the sheet, having re-read it several times in an attempt to find the clue that had led Baker to this rather sophisticated exhibit. "Kary book?" I said at last.

"Precisely, Woodside. Very good. Kary B. Mullis shared the Nobel Prize in chemistry in 1993 for the development of the Polymerase Chain Reaction or 'PCR' technique of DNA replication."

I finished the last bite of the whole-wheat donut, mutely wishing for another turn at the coffee urn. "That's rather out of my line," I said. "What about the purple tie?"

"You've hit upon it again, Woodside. A specialty manufacturer has issued a line of neck-ware that depicts the UV light image of various colorful crystals, vitamins among them, as a decorative feature. It's another indication of an interest in biochemistry."

I glanced over the exhibit. There was a rack containing a collection of half-filled test tubes, some photographs of rather sophisticated-looking laboratory instruments, and two bound notebooks, one containing a massive file of raw data computer print-outs, the other a tersely written account of the project. Not a particularly engaging first impression, except, of course, for the fact that the topic was extremely advanced for a high school student.

I was most keenly aware that I had violated one of the basic rules of the contest and should dutifully disqualify myself from judging the exhibit since I knew the name of the student. However, I convinced myself that my prior involvement with Baker and his current interest in this young man's plight should not in any way affect my objectivity.

It was at this point that the loudspeakers blared a call for the judges to assemble in the bleachers for a final briefing. I took my leave of Baker, who was already musing over the Biederbeck boy's display.

As one of six "Senior Chemistry" judges I was given a packet of pre-printed cards, each headed with a project number code. Glancing over the top card, I noted the list of judging criteria. I was to grade the corresponding project on a scale of 1 to 10 in about a half-dozen rather nebulous and somewhat overlapping critical categories: "Originality," "Creativity," "Scientific Thought," "Presentation," and a few others. And on the bottom half of the card I was to grade from 1 to 5 on a similar group of more objective criteria: "Spelling," "Grammar," "Use of References," and the like.

Although I was not completely comfortable with the subjective categories on the cards, it proved to be an interesting way to spend a morning. I proceeded from project to project, paging through reports and scrutinizing postered graphs, examining the occasional artifact intended to illustrate a key point, or a line of photographs depicting mostly kitchen table lab work.

As I worked my way through the card

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

deck I began to realize that there were quite distinct categories of exhibits for which there was no recognition amid the judging criteria. There were the projects designed to demonstrate some well-known principle of science. Many of these could have been transcribed from a science fair project book. (I had noted several such books in my frequent perusals of Philadelphia-area bookstores.) More genuine, somehow, were those projects that seemed to resonate with the student's personal interests ("What's in Lipstick?," "Octane Number and Compression Ratio"). There were those projects that seemed to be done as a school assignment, complete with the obsequious teacher acknowledgement ("Thanks to my teacher, Mr. ____" with the name censured with black marker by the fair authorities). And there were those obviously completed with major assistance from a relative who worked in an industrial, academic, or government laboratory.

On (disappointingly) few occasions there was an honest attempt at the scientific method: the formal statement of a testable hypothesis ("I believe the vinegar will give the highest voltage because it is more acid than the lemon juice"), and the diplomatic admission of error ("My hypothesis was incorrect—the vinegar and lemon juice gave the same voltage").

In these days of sophisticated word-processing software, spelling and grammar were not much of a problem (with the notable exception of technical terms). References were most commonly Encarta entries, although I noticed a few books and journal articles, as well as an occasional "personal communication" from a local university professor.

As I wended my path through the chemistry projects I found myself repeatedly casting glances toward Baker, who remained absorbed in Randy Biederbeck's exhibit. I had been saving that project for last in my deck of cards, although I had noted from time to time several of my fellow judges shouldering Baker aside to study it at length. When I finally got to it, it was noon and the caterers had begun to assemble a cold buffet for the judges' lunch.

Baker was pensive as I approached, holding his chin and tapping his cheek with a long index finger.

"Well, Woodside, what have you made of the competition?"

I shrugged. "It's not too bad, really. One of them used a chemical equation," I remarked, "although it wasn't balanced."

"I believe that you will find Master Biederbeck's project quite different."

I looked about nervously. "No names please, Baker," I whispered.

"Quite so. Nevertheless, it *is* a remarkable piece of work."

And, indeed, it was.

Deoxyribonucleic acid, the cell's information storage medium, contains millions of codons—sequences of the nucleotides: adenine (A), thymine (T), cytosine (C), and guanine (G)—containing precise instructions for the synthesis of proteins. Other codons control the replication and transcription sequence itself. Still other codons may perform functions as yet unidentified. But for a long time it has been believed that the massive double helix contains extensive non-coding regions—blank pages, as it were, in a set of programmed instructions. This young man's premise was that these non-coding regions could be used to insert and transmit coded messages.

A segment of denatured (that is, unwound and separated) DNA would be snipped out of one of these non-coding regions. So-called primers—synthesized duplicates of the nucleotide sequence on either side of the selected segment—allow it to be identified and manipulated. An artificial sequence of nucleotides is synthesized—letters, numbers, and punctuation encoded by three units (for example, ATC = A, GCT

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

= B, etc.)—and bracketed by the primer sequence. This is then inserted into the original DNA strand, and the message is buried in a mass of denatured DNA. The resultant solution could be dried to a dot over the letter "i" in a typed letter. The letter's recipient, with the appropriate primer solution, supplies of DNA polymerase, and the four nucleotides could replicate a million copies of the coded message and read it out easily using a DNA sequencer instrument. It appeared to be a foolproof form of cryptography.

I spent a full half hour going through the typed report. Randal Biederbeck had quite obviously had access to some fairly sophisticated laboratory equipment. There were photos of DNA synthesizers and DNA sequence analyzers along with a brief biography of their prime inventor, Leroy Hood. Other photographs showed robotically controlled pipetting stations, and bottles of reagents not likely to be found in any high school chemistry lab. Thumbing through the thick stack of bound printouts, which remained completely obscure to me, I also realized that the Biederbeck boy had had access to some advanced specialized software. His prime object had apparently been to implant the message, "Go Lions!" (his high school football team, perhaps?) in a microdot of DNA. And he had evidently succeeded since the last data page bore that message.

I stood back from the exhibit and let out a long breath.

"Quite a piece of work for a high school student, eh, Woodside?" Baker had retrieved another cup of tea and was stirring it with a small plastic straw.

"It's almost beyond belief," I said.

Baker tapped the straw on the cup edge. "Indeed. In cases like this your most difficult task as an exhibit judge will be to determine how much of the work—and perhaps more importantly, how much of the thought—came from the student."

I nodded absently. "I suppose that's what the student interview this afternoon is for."

"In part, certainly. Your charge will be to determine how well Master Biederbeck—I mean, this student—understands his own project."

"At this point I'm wondering how well I understand it myself," I said.

Baker sipped at his cup. "I have every confidence in you, old fellow," he said. "I may be able to check on some literature resources before the students arrive. There is something vaguely familiar about this theme. My larger object, of course, will be to find out more about his missing relative." He patted my shoulder. "It is likely that these two lines of inquiry will eventually intersect."

The catered lunch was an assortment of cold cuts and cheeses, salads, and a relish tray. The lower tiers of the bleachers were populated with middle-aged professionals eating from paper plates. I found a place next to one of the other judges from the Senior Chemistry category and sat down. He was a huge fellow with a gray crew cut and a periodic chart tie who worked for a New Jersey-based oil refinery. He was currently working on a massive triple-decker sandwich that he'd concocted for himself.

"Did you see that PCR project?" he said, chewing between bites. "That kid is either the next Albert Einstein, or the slickest con artist since Paracelsus."

After several attempts I speared a piece of ring bologna with a plastic fork. "Do you think he—or she—had help? I mean, I know they had help—but I mean too much help?"

"Had to. That's graduate thesis level stuff. This kid had big help from somebody in a molecular biology lab—probably a university prof." The big gentleman gestured with the remains of his sandwich. "It's usually a parent or a close relative. I've been judging these

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

things for ten years and I've seen a few like this. Last year a kid had one on chemiluminescence—nice display, had all the chemistry, balanced equations. He'd even synthesized the luminol, calculated yields—the whole bit. But he didn't really understand it. I caught him on a couple of things. Somebody else did most of the work for him. You've gotta watch. A lot of these kids have street smarts, you know? They talk a good line to you."

I nodded without agreeing, nibbling at a block of cheese. "Only, aren't we supposed to be encouraging them to—"

"Oh, yeah. But see, the grand champion here—the one that's picked tomorrow—they'll be going to compete at the Nationals. They get a free trip to that. That kid with the chemiluminescent light show last year—they would have been onto him right away. Would have made our local show look bad, you know?"

Somehow, I thought, something is being lost here. We seem to be obsessed as a culture with contests. We spend a lot of effort to give everyone that equal place in the starting line. And the message we're sending is that life is a race.

I looked up from my musing and Baker was standing in front of me with a rolled magazine in his hand. "'Enjoy your lunch, Woodside?" The big man next to me was staring at Baker, wide-eyed and open-mouthed. "I took the opportunity to dash out and locate a journal reference that should interest you." And Baker handed me a copy of the journal *Nature* from 1999. "Page 533," he said.

I thumbed through the pages and located an article in which three U.S. researchers had reported on the same DNA cryptographic process that the Biederbeck boy had used. The big guy was craning his neck to see over my shoulder.

"So it's not original work then," I said, pensively. "But still, isn't it remarkable that a high school student could actually reproduce work of this caliber?"

Baker smiled and nodded. "One would ordinarily think so, Woodside. Perhaps even more remarkable though, is that one of the co-authors of this original paper *was* a high school student."

Both the big man and I looked at Baker with what must have been somewhat baffled expressions. Before either of us could respond we were startled by a loud and rapidly growing noise level in the back of the building. It became evident that the school buses had begun arriving. The judges were vacating the stands and moving toward their assembly places among the exhibits. I got up and deposited my luncheon detritus in a trash receptacle.

As Baker and I walked back to the Senior Chemistry area, a torrent of students began to stream through the doors and fill the vacated bleachers. The stands began to transform into a roiling arabesque carpet of colors and clothing styles. They carried books and backpacks, Walkmen, PDAs, cell phones, Gameboys, and a farraginous assortment of other paraphernalia. The noise level with accompanying reverberation from the walls rose precipitously, until a draconian-sounding voice from the loudspeakers boomed: "*No talking!*" This served to mute the chorus of chatter for a few moments, but soon it began to rise again. "*NO TALKING!*" And this time the sound level dropped significantly. The bleachers now filled in comparative silence, except for the sonorous tread of feet.

I joined the coterie of chemistry judges while Baker returned to Randal Biederbeck's display. Looking out at the huge expanse of youthful faces, I was touched by a wistful pang. Marcia hadn't wanted children. That was long behind us now, though I still sometimes vaguely wondered what kind of parent I might have been.

Since the classes sat together in groups, I decided that the aspect of the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

stands was that of a patchwork quilt. It was immediately clear which schools had dress codes or uniforms. And these areas were liberally interlaced with colorful patches of free-form attire. The teachers sat with their classes so that a small number of adults were regularly distributed across the youthful tableaux.

"Leave your books and coats in the bleachers and when I call your category proceed to your project with *NO TALKING!*" From my vantage I couldn't see the microphone, but from the bored, yet mechanically emphatic tone, I conjured an image of a grizzled veteran school administrator, perhaps looking anxiously toward retirement.

I glanced over the reverse side of the card pack I had shoved in a shirt pocket. This was to be used for the student interviews. Again, it was a 1 to 10 grading system for things like: "Knowledge of Subject," "Amount of Help Received," "Projections for Future Work." I remembered reading in Carstairs' e-mail attachment that the fair's custom grading software contained some sort of pre-determined weighting factors so that low grades in these areas would diminish high marks from the obverse side. And vice, presumably, versa.

When the Senior Chemistry category was called, I scanned the bleachers for movement. Four girls and six boys began threading their way down the stands amid an obstacle course of abandoned school supplies and waiting students. The noise level, which had been modulating slowly, finally exceeded the threshold of censure: "NO TALKING!"

I enjoyed the student interviews particularly for the youthful enthusiasm I read on the majority of the faces. These teenagers were discovering science at a time when I just might have been closing down that phase of my life. Most of the students interviewed by my judging group had at least a rudimentary knowledge of the chemical principles involved in their project. The big man with the periodic chart tie consistently asked the most challenging questions. Already nervous, not a few of the students were visibly shaken by him. I did my best to assuage the effect by asking how they chose their topic or how they thought they could further develop it. I smiled at one little girl who had been brought close to tears by the big man's demand that she define pH. "Hey," I said, "we don't expect you to know all this right now. Anybody can look up a fact. Science is about truth. Find something new that nobody ever knew before and put *it* on the shelf, so that somebody else can look it up." I don't know how much it helped, but she smiled back at me. The big man scowled and penciled on his card deck.

As a group the chemistry judges had decided to save the DNA cryptography project for last, tacitly conceding that it would receive the highest marks from each of us if only the kid knew his stuff and had really done the work. As we proceeded through the other interviews, I repeatedly glanced over there, where Baker was in deep conference with a blond tousle-headed youth in a "Flowers of Evil—World Tour 2010" T-shirt, surmounted with a purple tie.

When we finally got there as a group, Baker stepped back, drawing some curious stares from the other judges. Baker nodded at me and I waved weakly, wishing he would lose the hat. The big man was already blustering about the project's topic, though I suspected that he knew no more about the subject area than I did—which was next to nothing. The boy's responses to direct questions were courteous and sounded accurate, if perhaps a little vague. I was convinced they were honest, however.

When asked about some detail of the polymerase chain reaction, he responded: "The polymerase comes from a bacteria, I think. The machine puts all the stuff in for you, anyway—the bases, the primer, the polymerase. Then it cycles through the temperatures." He rubbed

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

at his blonde mop. "Automatic, you know?" He squinted, undaunted, at the big man.

A couple of the other judges asked what I believed to be pertinent questions, and the boy's responses again seemed quite honest and appropriate. He was obviously not an expert on the subject, but he understood the basic principles better than all the judges. He freely admitted that his great-aunt had instructed and guided him through all phases of the work, which he did himself under her close supervision after hours at a well-equipped molecular biology laboratory. I asked where he got the first idea for the project and he quoted Baker's *Nature* reference—volume and page—telling us that his aunt had showed it to him when he'd asked her for project ideas. This seemed to impress the big man, who fingered his tie in thought.

At length, as a group we ran out of questions. We all shook the young man's hand. He seemed a bit uncomfortable at this. "Do I, uh, go back to my seat now?" he asked. We nodded and he was off like a shot.

We all turned in our completed card decks without further colloquy, although I noted the big man shaking his head over his last entry. The information on our cards would be digested by computer and overnight new card decks for the top ten projects in the Junior and Senior divisions would be printed. We were expected to reassemble here tomorrow morning to select the science fair's Grand Champion.

By now all of the students had returned to the bleachers, each having survived the close scrutiny of their work and an interrogation by a squadron of aging scientists. I noticed the big man still shaking his head as he donned a topcoat and shuffled toward the door.

Baker appeared at my shoulder as the loudspeaker announced the first group of school bus departures. "Well, Woodside, in your estimation, how did Master Biederbeck comport himself?" He had spoken quietly, but I was still uncomfortable about the use of the student's name.

"He handled the situation very well, I thought. I gave him the highest marks in all categories—except grammar."

"Indeed, I also noted several usage errors in his written report that were apparently beyond the power of his word processor to correct."

I looked about the huge room. "I haven't seen much of the exhibits in the other senior categories, but I have to believe that he has a chance to make Grand Champion."

"From a cursory scan of the physics, biology, mathematics, and earth science categories I must agree. However, my more immediate concern has to be the precipitous disappearance of his Aunt Hypatia, who was so instrumental in helping him."

This was the first mention of Baker's purpose here since early this morning, and despite a clear mental warning to mind my own business, I was very curious about his prolonged conversation with Randal Biederbeck. "So you've accepted the case then?" I said. "You're satisfied that she hasn't just accepted a job with an overseas drug firm, or eloped to the tropics with a colleague?"

Baker handed me my coat, which he had evidently retrieved while I was submitting my deck of judging cards. "I'm about to confirm that now, Woodside. The boy seemed genuinely concerned. Certainly you'll have the time to accompany me on a short fact-finding jaunt. Master Biederbeck provided some particulars—it's this very university where Hypatia Theonsky was last employed."

As we left the gymnasium building, we skirted some major construction work that seemed to be going on there and headed across a park-like setting flanked on all sides by large buildings. Ptolard was a small, privately endowed

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

liberal arts university on a modest tract of land in the midst of an urban/industrial neighborhood. Scurrying to keep up with Baker's brisk pace, I still managed to gather from some bronze plaques and building cornerstones that much of the original endowment had come from a well-known Greek importer who had built a cheese and olive empire out of a storefront operation in New York City.

"Just a moment, Woodside. I'll just pop in here and get some information." And with that Baker disappeared into the Administration Building, leaving me to observe pigeons and strolling students, and to wonder wistfully just what sort of bad dream I was being drawn into. Allowing it to happen, I corrected myself. Because, I reluctantly admitted, at some deep level I had enjoyed those quondam adventures. At least it seemed so in retrospect.

Baker emerged in two minutes with a foldout map of the campus. "Just the thing, Woodside. We want the South Wing of the Science and Engineering Hall." He adjusted his worsted cape as he scanned the surroundings. "Odd thing—the young lady in there seemed to think that I was looking for the theater arts department." He pointed at a multi-storied edifice in the distance. "Our goal, old chap," he said.

The directory in the lobby listed the various academic departments that occupied the South Wing, each heading followed by the department chair and a list of personnel in strict pecking order from full professors to instructors.

"Most curious," Baker mused. "The Biederbeck boy gave me the name Cyril Alexander as his great aunt's last employer, and yet that name doesn't seem to appear in the Molecular Biology department listing."

"Nor in Biology, Chemistry, or Genetics," I noted.

Baker stepped over to the North Wing side of the elevators, where a second directory was displayed. "Ah, here it is, Woodside—Cyril Alexander, Chairman of the Department of Physics."

We took the north-side elevator to the fifth floor. We quickly found the correct door and behind it a rather prim, middle-aged lady secretary. She looked over a pair of severe-looking, lanyard-tethered glasses at us. "Can I help you?"

I remembered quite well that Baker, despite his bizarre *modus operandi*, had an incongruous ability to charm certain women. I had seen it in operation with Marcia during our extended adventure in Lancaster 20 years ago, and I saw it now again.

"We would like a word with Dr. Alexander, if you would be so kind, young lady."

The secretary unconsciously patted at some graying curls. "I . . . am afraid that Dr. Alexander has left word that he was not to be disturbed."

"Oh, my! Is that Emeraude I detect? I have always been captivated by that fragrance."

You get the picture, I suspect. She buzzed her boss, who snapped at her a couple of times, but we got in.

Cyril Alexander presented a formidable image as we intruded upon his sanctum. Seriously balding, with glaring eyes canopied with black bushy eyebrows, and a dark mustache and goatee, he suggested to me nothing so much as a medieval Grand Inquisitor. "I can only spare a few moments, gentlemen. Please sit down." He waved at two empty chairs that faced his massive carved oak desk.

Baker didn't hesitate. "We have come to inquire after a former colleague of yours—one Hypatia Theonsky. A family member is concerned to find her present whereabouts."

Alexander shifted some papers on his desk. "I'm afraid I can't help you, Mr.—" He glanced at the business card that the secretary had carried in. "—Dr. Baker. Ms. Theonsky was a contract employee on loan from the Molecular Biology de-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

partment. We needed some additional programming skills for a short interval. This department employs a large number of programmers on a temporary or contract basis. People are coming and going here all the time."

"May I ask under what circumstances Ms. Theonsky left your employ?"

Alexander sniffed. "Frankly, Ms. Theonsky was not happy here. And I must add that we were not completely satisfied with her work—or with her work ethic."

Baker, who had assumed a relaxed pose, folding his long legs in front of the chair, was predictably undaunted by this character. "Ms. Theonsky was dismissed, then?" he asked.

"She voluntarily resigned on—" Alexander made a show of searching his desktop. "—August 29. Though, quite candidly, I can't imagine our—interest in her abiding much longer than that."

Baker's gaze had drifted toward a row of combination-locked filing cabinets. "May we inquire into the nature of the programming work in which she was engaged while she was in your employ?" He folded his arms and stared across at Alexander, who countered by also folding his arms. *A body language skirmish,* I mentally noted.

"Much of the work in this department, I'm afraid, is classified. This department is under a contract with the federal government to develop a quantum computing device." Alexander attempted a toothy half-smile that more closely resembled a sneer. "I *can* tell you that Ms. Theonsky was *not* engaged in any classified aspect of that work. As I told you before, she was borrowed as a skilled programmer from another department. The small portion of coding that she was assigned to work on was a very minuscule piece of a very large puzzle—an error correction package, in fact. When she chose to leave, her skills were easily replaced."

"Interesting," Baker said, sitting back and bridging his fingers. "Dr. Alexander, can you tell us if any aspect of these studies has been published in the open literature?"

Alexander took a deep breath and seemed to visibly swell behind the huge desk. "A extensive series of theoretical papers, authored by myself, and concerning unclassified and declassified aspects of the work have, in fact, created quite a stir," he said.

Feeling a bit irrelevant, I felt compelled to say something. "When Hypatia Theonsky left, did she leave a forwarding address?"

Alexander confirmed my irrelevancy with an annoyed furrowing of those dark bushy brows. "No. Her employer was the University; her permanent supervisor was the chairman of the Molecular Biology department. It would really be too much of a chore for this department to maintain detailed personnel files on all our hired help. I suggest that you gentlemen speak with Dr. Synesius of Molecular Biology."

Baker now leaned forward, fingers still bridged. "How long was Ms. Theonsky employed here as 'hired help?'" he asked.

"Two years, I believe it was."

"Two years in a department where classified work was proceeding and you kept no personnel files?"

Alexander's expression changed dramatically, and it was not pretty. "Employee screening and security are handled by an on-site government agent. Any questions you have in that regard should be directed to him. Now really, gentlemen—" and he stood up and glared at me, "—I have no more time for this."

Feeling like an offending piece of lint on a new suit, I stood up to leave, but Baker sank back into a languid pose in the chair.

"Where would we find these two individuals you mentioned?" Baker inquired, calmly.

"Dr. Synesius is on the third floor, South Wing, the government agent is a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Mr. Miles Orestian. He has an office on the first floor of this building. My secretary will provide you with room numbers." Alexander emerged from behind his desk and loomed above Baker's chair like a bird of prey. "Now I must ask you to leave. I'm expecting an overseas call of the utmost importance."

Baker looked up at him, almost disinterested. "The Nobel Committee generally calls in the early morning hours. I suggest you set an early alarm." Then he got up and we walked out.

The University had provided a small office for Miles Orestian. It was adjacent to a Campus Police complex of rooms, where a noisy card game seemed to be in progress.

Miles was short with very black curly hair and deep-set eyes. He seemed to be one of those people who never looked at you when he spoke. And right now he was concentrating on a liverwurst sandwich. "Sure," he was saying, "I remember Hypatia. Old, but—nice, you know? Nice rack on her. I liked her. Sorry to see her go. We were working on a Q for her, but it never got through."

Baker handed Miles a napkin as the rye bread began to shed raw onion rings. "That would be a Q clearance?"

"Thanks. Oh, yeah. That's the way it goes most of the time—somebody's been around—different jobs, different cities—a Q might take five years." He wiped yellow mustard from his mouth. "Alexander wanted all his programmers cleared. They can't do much—can't work on the classified stuff until the Q clears."

"Did Dr. Alexander see any urgency about the matter?"

"I can tell you this—Hypatia was golden when he first brought her up. He was after me to move up the priority on her clearance, but, like I told him, that might mean four years instead of five. I figured he was getting some of that, but I never let on. That was back a couple of years. Then things must have gone sour—for her to leave in a big huff, I mean."

"So it was only recently that Ms. Theonsky and Dr. Alexander had a falling out?"

Miles Orestian gestured with a wave of his sandwich. "You'd have to know her ways, but it was almost predictable. Hypatia is kind of a free spirit—an aging flower child. She still talks about Woodstock sometimes. Alexander is . . ."

"A little scary," I volunteered.

"You met him. Yeah, he's a real sweetheart." Miles shrugged. "In this line I've got to work with all kinds."

"Did you speak with Hypatia when she resigned from the University?" Baker asked.

Miles worked at a sandwich remnant stuck in a tooth. "Yeah, that's part of my job. The departure interview is sort of a formality for the un-cleared personnel, but, yeah, I talked with her. She was pretty upset, but didn't really get into any details with me. She said she was leaving for personal reasons. I suggested she go back to her old job under Synesius. They always got along. But she said something about that being a little too close to Alexander. She didn't want to be in the same building with the guy." Miles sucked a tooth. "Go figure women," he said.

"She left a forwarding address with you, then?" Baker inquired.

"Yeah, just a minute." And Miles proceeded to rummage through a filing drawer. "If she'd gotten her clearance, I couldn't give you guys anything on her, but as it is . . ." He pulled out a manila folder. "Here you go: 'Number 1 Penny Lane, Erewhon, New York'," he read.

We got to see Dr. Synesius without the slightest difficulty. He was feeding a collection of tropical fish in a large aquarium in the outer office of the Molecular Biology department. He was a short man who greeted us with a broad red-faced grin, brushing back a mop of white hair. "Hypatia? Oh my, yes—a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

wonderful woman—a brilliant, absolutely brilliant researcher. She was an instructor for our General Genetics undergraduate course before transferring to Physics. We tried to get her back when that finally fell through, but she said she had other plans."

Baker looked pensive. "How long did Ms. Theonsky work here before transferring to Information Science?"

"Let me see—at least ten years, perhaps a bit more. I had hopes of getting her into a tenure track at one point."

"Was there some special area of research?"

"Hypatia did some fine work in genome typing. She was particularly good with the equipment—the sequencers and synthesizers. She managed to keep the equipment running when many of us would have phoned for the repairman. But, then her real interest seemed to be with the software." Synesius sat on the edge of a desk and patted the top of a monitor screen. "She modified a number of our number crunchers to great advantage. I suspect that was how we lost her to Dr. Alexander's project."

"Publications?" Baker asked.

"Several co-authorships on bits and pieces of the Human Genome Project. We were a small satellite group here. I could find reprints for you."

Baker nodded. "That would be most useful. Did she maintain contact while she worked in the other department?"

"She would drop by on occasion. Last summer she brought a young nephew along. I believe they did some lab work for a high school project. We were always glad to see Hypatia."

"Did you speak to her before she left the University?"

"Very briefly," Synesius said, frowning. "She was upset, I could tell, but put up a cheerful front. I could only offer her a return to her old instructorship. But she said that she wasn't interested. She seemed set upon leaving the University."

"Did she discuss any plans?"

"Not really. Only that she needed some time to sort things out. I gave her my home phone number and told her that I would be glad to serve as a reference for her." Synesius stood up with a look of concern. "Is she in some sort of trouble?"

"Right now," Baker said, "all we know is that she is missing."

Throughout most of the preceding interviews, I had maintained the part of the mute observer, in part because I had little or nothing to contribute, but mostly because I had clung to the conviction that I would soon take my leave of Baker and the Hypatia affair and return to my motel room. It was now well past 4:30 and the campus was settling into a more sedate mode of scattered night classes and dorm life.

We were walking along one of the tree-lined paths, the early November sun just beginning to set. Squirrels were scampering among the fallen leaves and a scattering of individual students and couples were strolling between the buildings. Baker had been silently thoughtful and I was content to abstain from comment, with the hope and intention of extricating myself smoothly.

Then there was a low buzz and in the next moment Baker had a cell phone at his ear. "Indeed? Yes, of course. We'll be right over."

I distinctly didn't like the sound of this.

"That was Randal," Baker said, stuffing the phone into one of the inner pockets of his coat. "He just received an urgent note from his aunt."

At first I couldn't believe that Baker's 1960-vintage Volkswagen Beetle was still roadworthy. And, indeed, it moaned and groaned when he turned the ignition, but soon we were cruising along through the Newark suburbs, though I kept a firm hand on the overhead handgrip and another firmly plant-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ed on the dash.

"I believe it's here," Baker said, and we screeched to a stop in the driveway of a modest home with a porch and a swing.

Baker was out of the car in a moment and ringing the front doorbell while I sat waiting. He returned in a few minutes with a small envelope with no return address. He passed it to me as he restarted the reluctant engine. "Look at that, Woodside," he said as we pulled out into the street with a screech of tires.

It was a hastily scribble note:

"Dear Randy,

"If anything happens to me, I want you to know that your Aunt Hypatia loves you. You have the curiosity and free-thinking that it takes to be really good in science. Don't lose that! Don't be a drone! And think for yourself, always, even when everyone else, even your teachers, are marching in step. Remember me.

—Auntie

P.S. Don't show this note to your mom."

I was staring at the paper as Baker glanced over at me. "Well, Woodside, what do you make of that?"

I was transfixed by the dark red irregular spot in the upper right hand corner of the paper. "It looks like blood," I said.

It was a half-hour later and we had arrived in mid-town Manhattan at Baker's brownstone office/residence/laboratory. I was helping myself to a glass of sherry while Baker was examining the notepaper with a binocular microscope.

I had just taken a first sip of the Tio Pepe fino that Baker favored when I heard, "Woodside, be a good fellow and pop into the kitchen for a box of bicarbonate of soda."

"Where?" I called.

"Try the back of the refrigerator. Make up a dilute water solution for me, would you, old chap?"

In a few moments I produced the desired solution in a small juice-glass. I presented it to Baker, who retrieved some with a small medicine dropper. "A bit too red for dried blood," he said, applying several drops to the notepaper stain. To my instant amazement it turned blue. "Look at this, Woodside."

"What is it then?" I said.

Baker held up the bright blue stain to the overhead light. "Undoubtedly, an anthocyanin. And fairly concentrated."

That sounded familiar but the details escaped me. "A natural product compound?" I offered.

"Precisely, Woodside. Anthocyanins are water-soluble non-nutritive plant pigments. Like chlorophyll and the carotenoids, they provide color to plant life. However, they undergo a pH color change—they are red in acidic conditions and blue in an alkaline medium. Red cabbage, berries, grapes, the skin of apples, eggplants, and radishes all contain anthocyanins—even tree leaves, though there it is usually obscured by the green of chlorophyll until the fall." Baker studied the spot under a small bench lamp, using a large hand lens. "This is a particularly bright spot—I would surmise . . ."

I waited expectantly. "Yes, Baker?"

". . . pomegranate juice."

"Where on Earth would that come from?" I asked.

But Baker was already sorting though a file drawer. "Ms. Theonsky's note to her nephew was postmarked from here in New York City. I have a file that I compiled several years ago that may still be relevant. Ah, yes, here: 'Juice Bars in Manhattan.'"

"Really, Baker, is this disguise necessary?" I was looking at myself in a full-length mirror. I had been appointed in a black knit pullover sweater with a full black beard, sunglasses, and sandals. Baker appeared behind me in the reflected image. He had donned a mus-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tache-less goatee, a horizontally striped pullover shirt, and black neck scarf. This was topped by a black beret.

"Just the thing, Woodside," he said. "We want to remain as inconspicuous as possible. Haven't you heard of the new '60s retro among the college crowd?"

Frankly, I hadn't, though I was not about to admit it to someone who normally walked around in a deerstalker cap. "Of course," I said, "but where are we going?" I patted the top of my thinning pate. "And don't I need a hat of some sort?"

He handed his beret to me. "There you are. Now, Woodside, let us proceed at once to Greenwich Village, where the largest number of juice bars have been established near the grounds of New York University."

As we descended the stairs, I yielded to a thought that had been tugging at the edge of my consciousness. We were outfitted for a '50s Beatnik Era coffeehouse, while a juice bar struck me as more of a hippie/Age of Aquarius milieu. Baker had missed the retro fit by a decade. I raised the point at the landing, and Baker stopped short, becoming pensive for just a moment. "Indeed," he said, "very insightful, Woodside. Quick, then, let us re-group." And with that he dashed back up the stairs.

"Well, Woodside, what do you think?" We were back before the same full-length mirror. I was in a tie-dyed T-shirt with an afro wig, while Baker had donned a Nehru jacket with a peace symbol amulet draped by a cord around his neck. I held up two fingers weakly. "You have quite a wardrobe collection," I said.

"Here's your coat, Woodside. Let's be off. We'll take the Tube."

The subway ride was amazing for its lack of event. None of the bored passengers gave us a second glance. I was just trying to decipher some faint hieroglyphics on the graffiti-resistant inside walls of the car when Baker nudged me. "Houston Street, our stop." We dashed out just before the train doors slid shut and soon found ourselves in a strange setting of darkening streets. "We are within a short walk of New York University," Baker said. "There are undoubtedly some juice bars along this route."

I thought dimly of how this approach seemed to be a hopeless task. We were indeed looking for a very small needle in a gargantuan haystack. But I also remembered that Baker, for all his eccentricities, had bloodhound instincts that had served him very well over the years. And so the possibility of our finding Hypatia Theonsky did not quite diminish to zero, although the curve seemed to be asymptotically approaching that point.

Several places we passed were rock music bars, jammed to near fire law limits with people, and with accompanying sound levels loud enough to be a tangible presence on the sidewalk outside. There were bistro-style restaurants with steamy exhalations of smoke and garlic. And there was the occasional jazz bar with its older crowd—dinosaur establishments from, perhaps in some ways, a more innocent era.

Baker's purposeful stride suggested that he had a destination in mind. But, struggling to keep pace, I nearly ran into him as he stopped abruptly to peer at the street signs.

"Are we lost?" I suggested.

"Not at all," Baker sniffed, "I was merely wondering if it would be more useful to follow Thompson or Sullivan to Bleecker. Our first stop is along Bleecker."

"What exactly is our first stop?" I asked.

"Nikki's Nectars."

"Oh."

"It's not far, Woodside. Let us proceed."

Nikki was a dark-haired, dark-com-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

plexioned young woman with a scarab tattoo just above a plunging neckline. She spoke with an accent that I didn't immediately recognize. The place was dark, except for an annoying strobe light and rotating disco ball.

"Portuguese," Baker told me when we emerged back out onto the street. "She was most helpful. Pomegranate juice is sold in bottled form everywhere except at Gina's Juice Joint, where it is squeezed from the juice-encapsulated seeds of the fresh fruit. It is the perfect place to spatter a hastily written letter. This is spectacular news, Woodside!"

"I thought Nikki herself was pretty spectacular," I observed.

Baker knitted his brows. "A man in your position should not be misled by a leather skirt. However, if you find that you must sow your aging wild oats, I would be glad to take you with me on my next trip to Rio for Carnival."

I looked at Baker with an expression of gaping wonder.

"Now then, on to Gina's," he said and strode off. I closed my mouth and hurried to follow.

It was fully dark by the time we arrived at Gina's Juice Joint—a dimly lit storefront with a sizzling neon sign depicting bananas and strawberries tumbling into a three-foot rendition of a Waring Blender.

While Gina was not to be found, Tony the manager walked over in response to our query. His prolonged gaze at my hairline indicated that Baker's '60s retro idea was a very bad fit.

I adjusted the afro wig, which threatened to topple.

"Hypatia? Sure, she works here," he said and I saw Baker noticeably brighten. "Only thing is—" He paused. "You guys going to a costume party? Hey, we can supply the juice—"

"We are interested in locating Ms. Theonsky," Baker interjected.

"Oh, yeah, sure, Hypatia." Tony hesitated. "She sort of works here when she wants to. No regular hours, you know? We got two others like that. They call when they feel like working. I tell them, 'You can't come until rush hour tomorrow.'—you know, like that. It saves me money and the workers, they can chill until they need some bread. It works out for the both of us, you know?"

"When did she work last?"

"Friday—no, wait, it was Saturday she came in for a couple of hours."

"Do you have an address for Ms. Theonsky?" Baker asked.

Tony shook his head. "Phone number. Over there on the wall next to the phone." We found a list of names and numbers penciled onto the peeling paint of the wall.

"That isn't going to be much help unless she's home," I said.

"Go ahead and call her," Tony offered, "I got unlimited local."

"Thank you," Baker said, already dialing.

I scanned the place as we waited. I was intrigued by a mammoth device behind the counter, apparently designed to accept several hundred pounds of oranges and mash them, skin, seeds, and all, collecting the juice and rejecting the refuse into a holding bin. It was appropriately labeled with an embossed sign: "The Big Squeeze." There were only three or four patrons at the small tables and no one at the counter stools. A white haired old-timer in a berry-stained apron was sweeping the floor.

Baker held the phone receiver up before him. "Answering machine," he said and placed it back on its cradle.

"Can't help you then," Tony said. "Want some juice?"

"Did anyone you know socialize with Ms. Theonsky?" Baker asked.

Tony's brow furrowed. "Nah, she keeps to herself, mostly. I mean, she likes to talk to the college kids sometimes, especially the ones who bring books to read in here." He rubbed his temple. "Wait a minute! There was a time once—some kids got fresh with her—that was a couple of weeks ago, I

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

guess. Stash walked her home. Hey, Stash!"

The white-haired old-timer looked up. "What?"

"'You know where Hypatia lives?"

"He said Thompson Street," I was reminding Baker.

"Quite right, Woodside. But West Broadway will take us to West 3rd Street, where the New York University Student Center is housed. I suspect that Ms. Theonsky would choose a location near some academic environment. We can double back along Thompson."

We found the address at a row of brick walk-ups. There was, of course, no response at the bell, at which occasion Baker reached into one of the pockets of his Nehru coat and extracted a velvet-lined case of lock picks.

I glanced furtively about the darkened street, nearly toppling the afro once again. "Baker, are you aware. . . ?"

"Hush, Woodside. Ms. Theonsky may be in some sort of danger. Under the circumstances, a surreptitious examination of her quarters may reveal a clue to her location." His delicate long fingers had selected a thin rod and inserted it in the door-lock. "Certainly a bit of breaking and entering is justified at this juncture." And with that the lock clicked open under his hands.

With a glance at the street Baker tried the doorknob. "No double-bolt, no alarm," he said. "I thought as much." Then, swinging the door open, he found the light switch and we entered hurriedly. The first floor seemed to be a kitchen/living room area, but there was a flight of stairs covered in dark, threadbare carpeting. Baker glanced about briefly, but headed quickly for the staircase, and I followed dutifully. At the landing there was a closet-sized bathroom with worn fixtures, and at the top of the stairs was a large bedroom littered with a miscellany of strange and familiar objects.

Several recent issues of *Science* and *Nature* were scattered on the floor, accompanied by a distinctly mole-like stuffed toy outfitted in a miniature lab coat with the words: "The Year of the Mole" and "6.02253×10^{23}" emblazoned on it.

The bed was large and unmade and faced a computer monitor across the room that was endlessly scrolling an undulating horizontal message that read: "Live long and prosper!" There was a grease-stained empty pizza box on the nightstand, along with a nearly empty plastic bottle of spring water. A rectangular aquarium tank was set on a small table with an apparently contented fancy-tailed goldfish swimming sedately back and forth above a porcelain diver whose helmet was emitting a train of bubbles.

A chest of drawers stood against one wall, a mirrored dresser against another. Both showed several half-opened drawers with clothing contents overhanging the edges like vines from a planter. To my unpracticed eye it seemed as if the room had been hurriedly searched. I noticed my own image with the afro wig askew in the dresser mirror. In one corner of the wooden frame a sticker had been affixed: "Bad Hair Day."

"It appears that someone has gotten here before us," Baker said, "although I see no signs of a struggle."

I surveyed the clutter and rummaged a bit in one of the drawers. Several expensive-looking jewelry items and some loose currency seemed to eliminate a simple robbery.

Baker had walked over to the computer and tapped the space bar. The screen saver message was replaced by what appeared to be an Excel spreadsheet full of numbers. I was walking over to examine the screen more closely when I inadvertently kicked an old VHS copy of the movie, *Bob and Carol and Ted and Alice*, which lay on the carpet at the foot of the bed. Baker had been scrolling the spreadsheet with the mouse and had just reached the last en-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

try when I arrived holding the video.

"Very appropriate, Woodside," Baker said, glancing at the title.

"Whatever do you mean, Baker?" I hardly thought that the 1960s comedy about bed-hopping couples bore upon the case.

"The names have traditionally been used in discussions about public key cryptography," he said. "And they have been adopted workers in the much more nascent field of quantum cryptography. Bob and Alice, say, want to send secret messages to each other, so that they can't be intercepted by Ted and Carol. Bob sends Alice one of two quantumly entangled particles and stores the other. Alice then alters her particle in some way and sends it back to Bob, who measures the two particles together and can thus determine what change Alice made to the particle he sent her—and, thus, which of several messages she wants to send."

I found myself frowning at that. "If I understand quantum entanglement, doesn't that mean that Bob and Alice's particles always have to be in the same state no matter where they are?"

"Indeed, Woodside, if they are quantumly entangled they could be in different galaxies and yet must be in the same state."

"Then why must Alice send Bob her altered particle? Why must Bob measure both particles?"

Baker looked up from the screen, grinning. "Ah, but Woodside, you forget the Uncertainty Principle. If Bob could measure his lone particle, he would violate it. Of course, the approach I described has not yet been proven practicable, unless Alexander's work has led to new discoveries. The potential is there, however, to effectively double the capacity of a secure information channel."

I nodded as if it all made sense, which I had always found the most efficacious tactic in any discussion of quantum mechanics. I glanced at the computer screen. "Can you make any sense of those columns of numbers?" I asked.

Baker was still scrolling with the mouse. "Not with any certainty, although several of these progressions are suggestive. Unfortunately, Ms. Theonsky's columns are labeled only with default alphabetic codes."

"Do you think it has to do with quantum computing?"

"Possibly. You know, of course, Woodside, that quanta can be superimposed."

I searched my memory. "Two states at the same time?"

"Precisely. For example, a 'qubit,' that is, a quantum bit in a hypothetical quantum computer, could exist in the 0 and 1 states simultaneously until it was measured. At which event it would 'collapse' into one state." Baker looked up at me from the screen. "If one has a two-qubit word—"

"A qubyte?"

"Perhaps. At any rate, two qubits have four simultaneous values, again assuming binary logic—that is—" And he pulled out a pad and pen and jotted: (00), (01), (10), and (11). "A three-qubit word would have eight simultaneous values, a four-qubit word sixteen, and so on. The point is, of course, that the computer's machine cycles—its logical operations—will operate on all these values at the same instant in the same register. The potential calculating power becomes staggering when one considers that just 100 qubits represent 2^{100}, which is 10^{30}, distinct words. The potential is there to factor large numbers that are far beyond the practical power of conventional computing."

I'd reached a point where I felt the need to sound at least a little knowledgeable. "And factoring large numbers is the underlying basis of the best encryption systems," I offered.

"Exactly, Woodside. Something called RSA—an acronym for the last names of its three inventors—has become fairly standard. It is undoubtedly for this rea-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

son that the government is funding Alexander's efforts in order to control this technology. A hacker with a working quantum computer could easily eavesdrop on the most currently secure transmissions."

I scratched at my forehead. "Alexander led us to believe that Hypatia Theonsky was engaged in a minor, nearly irrelevant, aspect of the project—error correction, wasn't it?"

Baker looked up again from the computer. "That was a rather obvious prevarication, Woodside. Quantum error correction is, in fact, the key element in the development of a working system. 'Decoherence' is the term used. It refers to the loss of information due to interaction with the environment. The slightest perturbation—an errant photon, an atomic vibration—can instantly collapse the system and garble the output."

I sensed a Baker-style lecture coming on and sat down on the edge of the bed with an audible twang of its springs.

"Redundancy and frequent checks for altered bits is one approach, borrowed from conventional computing. There are also ways to use feedback loops based on anticipated errors that restore the system to a decoherence-free initial state. Everything, of course, depends on what physical system the quantum computer is based upon. Such a machine could be based on nuclear spin with readout by magnetic resonance techniques. In such a design a minuscule volume of organic liquid might serve the function of millions of computer memory registers. An analogous approach would utilize electron spin and read-out by electron paramagnetic resonance. An ion trap would work as well.

"The point is, Woodside, that the essential working quantum computer would interact weakly with its environment but strongly with itself. I believe the cloak of secrecy around Alexander's project may possibly involve quantum dots—small groups of atoms with an excess of one electron. The spin of that electron—up or down—would represent the two logic states of one qubit."

"And what of Hypatia?" I said.

"Quite so. Her immediate whereabouts must be our greatest concern." Baker inserted a diskette into the computer and copied the Excel file.

We were back at Baker's quarters. I was making coffee to stave off exhaustion and Baker was at his PC still studying the file from Hypatia's computer.

"There is something here, Woodside. But if you would use some of that excess energy to make me a pot of Earl Grey, I should be most grateful."

And so I dutifully served Baker his tea.

He was just raising his cup when I saw his eyes widen at the glowing screen.

"It's as clear as day, by George!" he said, nearly spilling his beverage.

I came over and squinted at the columns of numbers, whose meaning remained impenetrable to me.

"Don't you see it, Woodside?" Baker looked up at me. "No, of course you don't." I winced a bit at that, but as usual, managed to contain my chagrin.

"This first column represents the qubit register—an eight-bit byte, as it were. Note that its value remains unchanged in the subsequent 256 rows. The adjoining column lists the 256 possible states for that 'word.' The next column lists the real and imaginary coefficients that correspond to the amplitude of each of those 256 states." Baker pointed to the screen. "Woodside, this appears to be a mock-up of the output of a working quantum computer."

"I'm afraid I don't quite . . ."

"The amplitude—actually the sums of the squares of these two coefficients in the third column, which appear in the fourth column—is the quantum probability that a given state of a register is the true value. At the beginning of a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

run, these values would all be the same: all equally probable. At the conclusion of the program execution the register states with the highest probability represent the output."

"Why did you call this a 'mock-up' Baker? Couldn't it be an actual output from a quantum computer?"

Baker shook his head with that look that had always made me feel like a particularly dull schoolboy. "No, Woodside, these registers could never be seen in a real quantum computing device. When the program had finished its operations—matrix multiplication, or whatever—it would, indeed, have returned such a set of numbers. But the act of measurement—the read-out in this case—would have returned only the true or highest probability value and have destroyed all other values. The Heisenberg Clause again, as it were."

As I looked at the long lists of numbers, a question occurred to me. "Back in the '60s when computing was still pretty primitive, wasn't there—"

Baker visibly brightened. "You may have hit upon it, Woodside! Before hexadecimal and 32-bit words, there was octal. The technical difficulties of quantum computing severely restrain word size. Before one can run, one must crawl."

"Do you think that Hypatia Theonsky left an octal coded message?"

Baker nodded. "It is an excellent conjecture. We just select the highest probability output from each of 256 rows for each octal bit. Ms. Theonsky must have known that she was being watched and chose this means to leave a clue to the mystery. Be a good chap, Woodside, and grab a paper and pen to jot this down as I scroll through this spreadsheet."

I watched it evolve and I recorded it as Baker scrolled, calling off the eight-bit string that represented the highest probability for each register. It took rather longer than I imagined. My coffee had grown cold, but I sipped at it when we had finally finished and I handed Baker the list of digits.

Baker pounced upon the paper and dug some reference texts out of a desk drawer. "Woodside," he said, flipping through dog-eared pages, "don't you miss those machine language days when it took 20 programming steps to add two numbers?"

At first I thought he was joking, but the unrestrained and uncharacteristic glee on his face suggested that he was not.

"Here it is, old fellow. They are, in fact, alphabetic characters in hexadecimal code." And he began to write letters down the page after each 16 binary digits: "G-O-L-"

"Of course," he said. "How could I have overlooked it?"

"-D-F-I-S-H"

I drained my cup. It was going to be a long night. "The goldfish in Hypatia's apartment?"

"We must return at once." Baker was already up and moving.

"Can we dispense with the costumes?" I suggested.

"The time for subterfuge is past, Woodside. Hypatia Theonsky took some pains to conceal this message, and I believe that unfriendly forces may have a copy of this spreadsheet. We must move with alacrity."

This time we took the Volkswagen and, despite a series of aggressive bumper nudges from Manhattan cabbies, we made it to Greenwich Village. When we arrived at Hypatia's apartment the front door was slightly ajar, despite the fact that Baker had carefully closed and relocked it upon our recent departure. "An ominous sign, Woodside," he said, as we pushed in and mounted the stairs.

The apartment's bedroom was once again devoid of occupants and appeared just as we had left it, except—Baker was standing next to the aquarium, where the helmeted diver

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

continued to stream bubbles. There was water on the sides of the tank and a small puddle on the table. And, of course, the goldfish was gone.

"Baker, what do the goldfish have to do with all of this?" I had been holding back the question, trying to figure it out on my own, but had failed completely.

"The DNA non-coding segment cryptography, of course, Woodside. An elaboration of young Randal's project, but inserted into living DNA. The goldfish, undoubtedly, was the subject of such an experiment."

"But what could be the message?"

"A key to something vital, I would surmise. And now, someone has that information."

"What do we do now?" I asked.

"In the absence of useful data we play the odds, Woodside. We disturb the rest of Professor Synesius."

"A goldfish? Oh, yes, I suppose it's just possible with some of the techniques that Hypatia developed. But why would anyone want to leave a message embedded in the DNA of a living animal?" Dr. Synesius was in a bathrobe and wearing a shower cap.

"As a subtle form of concealment, doctor. We have a strong suspicion that Hypatia is in danger."

"My God! Really? Where is she? I'll get dressed at once." Dr. Synesius appeared quite upset.

Baker attempted to calm him. "We don't know her whereabouts, doctor. However, I suspect that whoever removed the goldfish from Ms. Theonsky's apartment will need the facilities in your laboratory to decode the message. If you will gain access for us, we can investigate."

"Of course, just give me a minute." And with that the little man disappeared up the stairs to re-emerge a few moments later in street clothes. "I'd better drive us. Campus Security knows my car."

Baker hesitated but agreed and we piled into the plush luxury of a late model Lincoln Town Car.

"I can't believe that anyone would want to harm Hypatia," Synesius said, as we backed out of the driveway, carefully avoiding Baker's parked antiquity.

Baker remained silent until we neared the Ptolard campus. "How much do you know about Cyril Alexander, doctor?" he said at last.

"Cyril? A bit uptight, perhaps. I haven't a lot of dealings with him, except for those personnel transfers. He's always draining away our best programmers." Synesius changed his tone. "You're not suggesting that he is somehow involved in Hypatia's plight?"

The dark trees of the campus streamed by the car windows, the winding footpaths now deserted. Baker allowed the soft sound of the engine to fill the delay in his response.

"I have conjectured that Ms. Theonsky played a much larger role in the quantum computer project than Dr. Alexander was willing to admit to us—that, in fact, she holds the key element in decoherence correction. The success of the project may hinge upon some software coding that she developed."

Synesius braked at a red light, his fingers drumming nervously on the steering wheel. "And you believe all this code has been embedded in the DNA of her pet goldfish? I hardly think—"

"No, doctor, but, perhaps a location cipher—something like a locker number or a safe combination for some cache where a disk or hardcopy of the software resides."

Synesius knitted his brows as the light changed and we pulled out. "Do you think Hypatia herself has been abducted?"

"She may have given her pursuers the slip and may currently be 'on the run.' In the meantime, her subterfuge has been discovered, and her pursuers may be on the verge of discovering her hidden coding."

"I still find it hard to imagine that

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

someone with the name and academic reputation of Cyril Alexander would resort to such tactics." Synesius turned into a five-story parking garage that adjoined the back of the Science and Engineering Hall.

Baker remained silent as we spiraled up a ramp and emerged on the third floor, where Synesius slipped the sedan into a reserved parking space. We climbed out and Synesius led us at a brisk pace across a skywalk into the Hall, where a bored uniformed guard at a small card table waved to him. We all hurriedly signed the clipboard register, where I noted among the half-dozen or so after-hours signatures the name of Miles Orestian, who had arrived at 8:35 PM, approximately a half hour ahead of us. We received plastic badges that we clipped to our lapels and we proceeded down a long hallway.

Synesius stopped abruptly. We had arrived at the Molecular Biology office and the frosted door panel was illuminated from within. Synesius drew a deep breath. "My God, perhaps you're right! Someone's in there!"

Baker already had his right hand on the door handle, the other thrust deep into the pocket of his overcoat. Synesius stepped back and got behind me. Once again I was following Baker into the unknown.

Baker swung the door open with a sudden movement. The outer office was fully lit but deserted. Synesius gestured toward one of several doors that evidently led off into laboratory areas. The door had a simple black and white sign: "PCR," and although of solid metal, a slit of bright light shown on the floor at the threshold.

Baker stepped over and hesitated, listening. There were a few faint clicks and taps, but no speech. He reached slowly for the brushed metal doorknob and gave it a twist. My heart, which had been thumping since the parking garage, was now beating in my ears. Baker swung the door open to reveal a brightly lit laboratory with mechanical shakers and rotary evaporators lining one bench and an array of impressive-looking instruments, each with its own robot-arm sampler/dispenser. There was also a bank of desktop computers. And at the nearest one sat a young man with a red beard, attired in a white lab coat with a lapel tag that said: "Henry." He had freckles and a small cicatrix just above his right eyebrow, and he was apparently alone.

As we entered he looked up curiously, then said: "Oh, Dr. Synesius, I was just about to phone you. I've just now gotten the code message from the goldfish tissue."

Baker and I turned around as if with one thought. And, of course, kindly old Dr. Synesius had a very large silencer-fitted handgun pointed at us.

"Please withdraw your hand from your pocket, Mr. Baker," he said. "And both of you must raise your hands. High in the air, please!"

Synesius was sweating a little as he frisked us. My pockets were empty, but Baker had been "packing" several black licorice full-bent pipes and a clear plastic water pistol, characteristically unloaded. As this stuff hit the floor, Synesius stepped back and regarded us. "You gentlemen have become an expected problem as annoying as Hypatia herself."

"So then you don't have her?" Baker said, smiling despite our present situation.

"It is only a matter of time. Alexander's agents—"

"Dr. Synesius?" Henry was holding a printout sheet.

"Mr. Aldrich, would you just read the message! You can see that I'm busy."

Henry squinted at the output, then read: "'Randy's raw data, pages 87-374.' I'm afraid I can't make anything out of it. Would you like me to show you the transcription patterns?"

Synesius waved the gun carelessly and I could see Baker's wheels turning,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

but he didn't try any moves. "That's not important, Henry, I understand the message. But I'll need you to watch these gentlemen. Where is your handgun? We are going as a group to that brat nephew's project in the gymnasium."

Henry reached into a lab coat pocket and retrieved a black snub-nosed revolver.

"So tell us, doctor: what drove you to team up with Alexander?" Baker's tone was conversational. "Did he promise you a share in the Stockholm money?"

"You've heard then? It's been announced?"

"No, actually I was surmising that the Nobel award would be forthcoming after Alexander's last series of journal articles. His theoretical treatment of quantum information has been a groundbreaking approach. Although he has hinted at a working 100-bit quantum computer, the details have been cloaked by US government security."

Synesius wiped at his sweat-matted white hair, but his gun remained steady. "It *is* expected, yes. And Dr. Alexander has promised to be generous to those of us who help him tidy things up a bit." He looked over at Henry, who was twirling his pistol by the trigger guard. "Henry, is that thing loaded? No? Then put your bullets in. And no fooling around!"

Henry dug in his lab coat pocket and produced a handful of bullets. He proceeded to load his weapon.

Synesius stared at us. "Unfortunately, you gentlemen are now part of the housecleaning. You will accompany us for the moment. Now, please to start walking! And remember to smile silently at the skywalk guard."

Synesius drove while Henry kept us covered with his little black gun. The gymnasium parking lot was empty, but all the interior lights were on. A large foundation hole for a major addition to the facility was surrounded by "Caution"-emblazoned wooden horses and yellow, battery-operated flashing lanterns. Several large piles of crushed rock were in evidence, as were idle dump trucks, backhoes, and bulldozers.

We emerged from the Lincoln and formed a small group at the facility's main entrance. Synesius produced a key but found that the door was unlocked. He and Henry waved their guns at us and we entered, Baker leading the way to the Senior Chemistry exhibits. In the echoing silence there was a slight noise, and Synesius brought us up short with a poke from his silencer and a loud whisper: "Stop!" We all halted in a frozen tableau. There were a few moments of total silence, followed by a faint sound like padded footsteps.

I heard Synesius murmur one word: "Hypatia!" This was followed by a metallic noise, like a lever or a mechanical relay closing.

"It's the candy machine," Henry said. "I'd know that sound anywhere."

Henry led us back toward the entrance where a plump, middle-aged woman in a floor-length dress was munching a confection. A sheaf of papers was tucked under her arm.

"Ms. Theonsky, I presume," Baker said.

Hypatia waved her candy bar wrapper at us between bites. "Bad guys win again," she said.

"Henry," Synesius said, "please relieve Hypatia of that hardcopy printout."

With remarkable calm in light of the display of small arms weaponry, Hypatia took another bite of her candy bar and extended the inch-thick stack of papers toward the red-bearded accomplice. Henry reached for it just as she let it slip from her fingers. As he stooped to catch it, Hypatia delivered a well-aimed kick to the groin and Henry folded like an accordion. At that Baker grabbed for Synesius' gun hand, but missed by inches as the little man squeezed the trigger. There was a startling *thunk* and a large hole in the candy machine next to Ms.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Theonsky.

Synesius backed up, the gun leveled at all of us. "No one will move! Henry, get the printout."

Henry seemed out of commission for the moment. "You will all back up against the far wall," Synesius said. He was sweating profusely, but his aim remained steady. "Henry, hand me the papers!"

Henry was still on the floor, but he passed up the papers with a grunt.

"Very clever, Hypatia, concealing the decoherence correction software in plain sight in your nephew's science fair project. Those obtuse judges had no clue as to what it represents."

I felt that, but took some comfort from the fact that Baker had viewed it as well.

"Henry, will you stop groaning and get up!" Synesius nudged the lab technician with his foot.

"She kicked me in the—"

"Never mind about that, get up and get your gun!"

Henry struggled to his feet and shakily took aim at us.

Synesius hefted the stack of papers. "With this the quantum computer becomes a practical tool rather than a theoretician's daydream."

Hypatia seemed to have retained her cool. "You never struck me as the loyal follower type, doctor. Why are you acting as a henchman for Alexander?"

Synesius licked sweat from his upper lip. "You are quite right, my dear. Alexander has promised me some pittance share in his expected Nobel Prize money, if I would help facilitate matters. That fool cares only for the robes of honor. But I have my own agenda—"

Baker spoke up. "Then you are prepared to supply information on quantum computing to forces that are seeking to disrupt the world economy?"

Synesius mopped at his brow with a white handkerchief, but did not lower the gun in his other hand. "Exactly, Mr. Baker. The most secure public key cryptography algorithms, like RSA, will be child's play for this device. There are organizations—and governments—that are willing to pay handsomely for the ability to intercept bank transactions and login to defense systems. Alexander can have the glory. I'm going to collect the real profit."

"And so you have complete plans for the device?"

Synesius held up the sheaf of papers. "*Now* I do," he said.

"And so, I assume, we three are an inconvenience," Baker sniffed.

I looked at Baker in complete dismay. Like we had to remind this guy to kill us.

"Yes, quite an inconvenience. But fortunately I have a plan which will result in three unrelated missing person stories." Synesius nudged his accomplice. "Henry, we're going outside. Keep your gun on them!"

Henry shook himself and took unsteady aim.

"You will walk slowly in front of us. We are going out the side door." Synesius waved his long barrel and we walked.

Outside we stumbled amid the construction site. We were stopped at a line of "CAUTION" tape. "You may proceed down that slope, beyond the tape, dead or alive," Synesius said. "The choice is yours." And he raised the silencer.

We moved under the tape and down a steep, dark incline of moist clay, finally tumbling and sprawling at the bottom of the pit.

I heard Synesius bark some indistinct orders at Henry, followed by some crunching of gravel.

And then there was the distant sound of a diesel engine starting.

I scrambled to my feet on the slippery clay and helped Ms. Theonsky up. "Thanks," she said, grabbing my elbow for support. "I thought at first that you two were a part of this."

Baker had regained his footing as well. "Your nephew enlisted our aid

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

when you chose to go underground." The diesel growl was growing louder, and in the dim light I saw Baker look up toward the top of the pit. "And unless I am mistaken, we are about to go underground ourselves—"

I swallowed hard. "You mean—"

"Henry is about to dump a large truckload of crushed stone on us," Baker observed.

I felt the pit wall just behind us.

"Quite impossible, Woodside. The slope is too steep and slippery for any unassisted ascent."

"Then I suppose that we're trapped," Ms. Theonksy said, rather matter-of-factly, I thought. "It seems a shame to end it all as the foundation for a physical education annex. I was never much of an athlete."

I looked at the two of them, discussing our mutual demise with the same detached calm. I, on the other hand, was beginning to panic enough for the three of us. The diesel sound was growing to a loud roar, and I heard the crunch of tires on gravel.

Retirement. The golden years. Sitting by the hearth with a glass of wine and a good book. I saw it all evaporating. *And Marcia gets the widow's pension. Running off to Mexico with that Raoul character, her dance instructor.*

"He only wants the pension money," I muttered.

"What's that, Woodside?" Baker had produced his cell phone from some inner pocket. "I was about to call for help, but it appears to have already arrived."

There was a siren growing in volume, and the diesel engine stopped abruptly.

In another moment there was some indistinct shouting, then we heard: "Is everybody okay down there?" It was the voice of Miles Orestian.

Orestian, who had evidently consciously cultivated his obtuse persona, had been suspicious of frequent meetings of Alexander and Synessius. An authorized phone and e-mail check on Synesius had revealed a series of communications with unsavory elements in places like North Korea and Libya. And our evening excursions at the Molecular Biology department and the gymnasium had been observed. At any rate, we were rescued from the construction pit, and Synesius and Henry were apprehended.

The morning paper carried the news that Cyril Alexander had received the 2011 Nobel Prize in physics for his development of the detailed theoretical treatment behind quantum computation.

I had gotten back to my motel room at the crack of dawn, after a long night of questioning and legal depositions. I looked at the mattress longingly, but realized that I was expected back at the Science Fair for the final judging at 8 AM.

I half-consciously rubbed the electric shaver across my face, staring blankly into the bathroom mirror. If Synesius implicated Alexander, which I believed he would, it would make for some interesting newspaper headlines: "Nobel Laureate Accused of Treason," perhaps. Or, I mused cynically, Synesius might be "bought off" by a pledge of clemency to preserve the dynastic aura of U.S. Nobelists.

Randy Biederbeck did not receive the Grand Champion award at the final judging. That honor went to a math project that a girl, a high school sophomore, did on Fibonacci numbers. It seemed to be a brilliant piece of work, and the math judges were enthusiastic about her responses in yesterday's interview. Randy *did* come in second, and, as Reserve Champion, got the trip to the National as well, much to the chagrin of the big guy with the periodic chart tie.

I was donning my coat when I noticed Baker and Hypatia striding toward me. "The candy machine is marked with an 'Out of Order' sign," Baker said with an amused chuckle. "Perhaps

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

you'd care to join Ms. Theonsky and me for lunch?"

I shook my head. "I'm exhausted and I've got a long drive home. I'm going back to my motel room for a few hours sleep, and then I'm hitting the road for King of Prussia." I explained the results of the final judging, and mentioned the news of Alexander's Nobel Prize and its implications.

"You are quite right, Woodside. There may be some move to suppress or minimize Alexander's involvement in this messy business. I gathered that he has covered his trail carefully, allowing Synesius to assume all the risk." Baker looked at Hypatia, who had replaced her mud-soaked gown of last night with a bold flowered print. "However, Ms. Theonsky has agreed to go public with the complete details of her story. And a newspaper account is likely to at least raise some doubt."

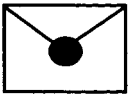
Hypatia nodded, her graying tresses secured with a pearlescent comb. "They got Goldie. He'll have to pay for that," she said.

I had little to add. We took our leave. The motel bed seemed to be calling me.

But as we left the building, through the fog of exhaustion, I distinctly noticed Baker's arm around the flowered waist of Hypatia Theonsky. ■

CUSTOMER SERVICE OR SUBSCRIBER ASSISTANCE

Please direct all changes of address and subscription questions to:



ANALOG SCIENCE FICTION
6 Prowitt Street,
Norwalk, CT 06855

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ORION

I don't know how old I was when I first heard about Orion, the "spaceship propelled by atomic bombs." I was probably in my mid-teens. I do remember thinking, "What a *cool* idea!" I wanted to know all about it. Unfortunately, there wasn't all that much publicly available information about Orion back then. The concept was something of a legend in science fiction circles.

By the late '70s and early '80s, I finally began to learn more. Jerry Pournelle wrote about Orion a bit in some of his science columns for *Galaxy*, and a picture of a conceptual Orion-style spaceship appeared in an installment of Carl Sagan's popular *Cosmos* PBS series. I eventually tracked down Freeman Dyson's article in *Science*, "Death of a Project," and entirely via serendipity I came across Kenneth Brower's *The Starship and the Canoe*, a biographical book about Freeman Dyson and his relationship with his son George.

Later came science fiction novels with nuclear-bomb-propelled spacecraft as keys to the plot. *Orion Shall Rise*, by Poul Anderson comes to mind. And the aliens in Niven and Pournelle's *Footfall* are defeated when a crash program by the humans produces an Orion spaceship loaded for bear and ready for battle that proves too formidable for them.

Though the project may have died as Freeman Dyson detailed in his piece, the idea survives, and the concept has perhaps more power now than ever to capture the imagination and hold it. And my children, should their imaginations demand it, won't have the trouble I had in learning about Orion. For in a fit piece of historical irony, George Dyson, son of Freeman and the "canoe" portion of Brower's book, has written the definitive (unclassified) account of Project Orion.

Project Orion: The True Story of the Atomic Spaceship (Henry Holt and Co., 2002. ISBN 0-8050-7284-5) is a remarkably interesting book, and not just because of the spaceship. It offers a look into an alternate universe where physicists and engineers were allowed to work essentially unfettered by the demands of bureaucrats and paperwork. It is a world where an idea could go from the chalkboard to full-scale testing in the south Pacific within the same calendar year. Indeed, General Atomic, where most of the work on Orion was done, seems to have been as *Heinleinesque* a haven for can-do scientists as has ever existed on this Earth.

For those (no doubt few) of you who have no idea, or perhaps only a hazy idea, of what Orion was all about, picture this: A spaceship, about 200 feet tall, 30 or so feet wide at the base (which consists of a thick metal plate), standing out in the hot desert sun. The weight of this ship is 4000 tons, 25% of which is payload, 25% of which is that pusher plate on the bottom, and the rest of which is ship and nuclear bombs. Connecting the base plate to the upper part of the ship are six tall shock absorbers.

The clock counts down and at T minus zero we have blast off—and in this

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

case, we really do mean *blast off*, as the first bomb detonates underneath the plate. Of course, the common understanding of nuclear bombs is that they are good for nothing except blowing things to smithereens, so what a surprise it is to see the spaceship begin to rise into the sky, rather than disappearing in a mushroom cloud. The first blast is followed less than a second later by another, and then another, and another. Blast follows blast follows blast, the potency of the blasts slowly increasing from shot to shot, until the last blast putting our Orion ship into orbit is, at five kilotons, perhaps ten times more powerful than the one that got her started.

To a generation for which World War II exists only in books, movies, and a father's memories, and for which the mushroom cloud will forever be vilified as "the destroyer of worlds," it may seem inconceivable that a spaceship like Orion can exist at all. How can anything withstand the blast of a nuclear bomb? Indeed, even during its heyday, at a time when H-bombs were routinely air, land, and sea-tested, the Orion concept was considered outlandish at best, and more often than not, self-evidently suicidal. As Freeman Dyson recognized, "If you do not think about it carefully, it looks obvious that you can't do it." (p. 66)

But when you *do* think about it carefully . . .

It helps to know what made Ted Taylor, the driving force behind Orion, come to believe his spaceship might work in the first place, and this is described by George Dyson in a chapter entitled "Lew Allen's Balls." It is the case that during some nuclear tests, iron and steel balls containing some "test material" were suspended near the towers that held the test bomb. The spheres were coated with graphite, and it was hoped they would survive the blast enough, even after having been hurled a considerable distance, to be recoverable, thus protecting the "test material" for examination. Though some of these spheres had literally been within 20 feet of the center of a tens-of-kilotons nuclear explosion, surprisingly they often showed no evidence of it. The heat and radiation from the bomb would cause the graphite coating to ablate, and this would protect the spheres. So Taylor reasoned that if a coated sphere could survive the blast, so could a coated pusher plate.

It also helps to know that Ted Taylor was the Beethoven of nuclear bomb design. He knew how to make atomic bombs that required less than a kilogram of plutonium. Furthermore, he knew how to make shaped nuclear explosions, which greatly enhanced the per-pulse efficiency of each charge. So the image that no doubt comes to most people's minds of some kind of big water-tower-looking thing atop a Hiroshima-esque mushroom cloud is a false one. It would have looked much more like a Saturn V launch with the bright exhaust at the tail strobing at about one hertz.

(The astute reader has perhaps already noticed in the preceding paragraph two clues as to why many of the official reports written for the Orion project remain classified more than 40 years later. Details as to just how little plutonium you really need to build a nuclear bomb are details best kept under wraps. Secrets about how to get most of the destructive energy in your nuclear weapon to go just one way are secrets best held close to the vest. During many of the interviews Dyson conducted with former Orion project workers, they would interrupt themselves to say, "But I can't talk about that," or words to that effect.)

An early version of the "baseline" 4,000-ton Orion vehicle pictured the use of 800 bombs to reach a 300-mile orbit. The first bombs would only yield about .15 kilotons, and it would take until about bomb number 100 before you got to the "standard" charge of 5 kilotons each. You can use smaller bombs in the atmosphere because the surrounding air allows for tighter coupling of the charge

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

energy to the plate.

That's a lot of bombs. One big fear with building Orion was just this: What do you do if one of your bombs doesn't go off? Scarier than that was the fear that only the high explosive surrounding the core might go off, and not the nuclear explosion itself. Then you'd have a load of high-velocity shrapnel slamming into your pusher plate. Ted Taylor said their solution was to "make damn sure they all go off." (P.91)

Another big fear is radiation. It's obvious that if the pusher plate didn't also protect the crew from the radiation of the bombs, the entire Orion propulsion idea, at least for manned spaceships, would have been a non-starter. That leaves us with the problem of fallout from the bombs as the ship leaves the surface of the Earth.

Orion was conceived in an era when above-ground nuclear tests were commonplace. A flight or two of a full-scale Orion space vehicle would have only added a percent or two of additional fallout into the background that was already there by virtue of weapons testing. Nevertheless, as the problem of fallout and nuclear testing in general began to weigh more and more heavily on the politicians during the late '50s and early '60s, it soon became clear that Orion might never be allowed to lift off from Earth. So greater effort was put into designing smaller Orion ships that could be launched in pieces via chemical rockets for assembly in space. Given this possibility, even Wernher von Braun became an enthusiastic supporter of Orion.

Unfortunately, the book brings to light here one caveat about fallout that was certainly new to me. As it turns out, simply not using the bombs until the ship is in orbit will not prevent the fallout from reaching the Earth's surface. The bomb material is ionized by the explosion and the cloud of charged particles (many of them radioactive nuclei) gets trapped by the Earth's magnetic field. So if fallout is a big concern, then the Orion ship must either be boosted outside the Earth's magnetosphere prior to using the drive (and if we can do *that*, do we still *need* Orion?), or we need to use cleaner bombs.

It's been 40 years since the program officially closed up shop. Right up to the end, Ted Taylor was still trying to save it. He found solid support from one Lt. Col. John R. Burke (well known at the time from other nuclear-powered projects). In January of 1965, Burke argued in favor of preserving Orion with these words, and they remain true today: "ORION is not just another advanced propulsion system. Practically every DOD/Air Force and NASA evaluation over the past 3 years has concluded that ORION provides the only capability for missions well beyond those achievable with chemical or nuclear rocket propulsion. The results point to a technique of rapidly traversing interplanetary distances substantially superior to any other method known today. . . ." (p. 267)

If there are some methods "unknown" to most of us but perhaps mastered in a black-budget bunker, then we may never need Orion to own the Solar System. For myself, I have never been turned off by the idea of using nuclear bombs to propel a spacecraft, not even if one launches from the ground. Hell, the twenty-first century contains so many other ways to kill you that I wouldn't care if the background radiation levels went up a bit just so long as it meant I had a fighting chance of *leaving* the Earth altogether in a decade or two.

And NASA appears to be getting on board again to some extent. On page 292 Dyson relates, "NASA *is* dusting off the old idea, both as a prospect for future interplanetary missions and as a near-term contingency plan for asteroid and comet defense. The Nuclear Pulse Propulsion of Orion times has been renamed 'External Pulsed Plasma Propulsion'—removing most references to 'nuclear' and all references to 'bombs.'"

A "rose by any other name," I guess.■

JEFFERY D. KOOISTRA

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Probability Zero

Keeping Track

Richard Foss

The high priest facing the giant stone disk made a hasty obeisance as a jaguar screamed in the distance, then turned back to the circle of sub-priests who sat next to the stonecutter. For a moment there was nothing but the chattering of monkeys in the forest below the pyramid. The high priest counted again on his fingers and toes, then looked at the waiting circle of men.

"So the day of the dog is followed by the day of the monkey in the month of the new sun in the great cycle of the Father God One Hunahpu?"

The chief calculator bobbed his head affirmatively and grinned, showing pointed teeth inlaid with jade. "Which will be repeated eighteen times twenty, times twenty, turnings of the Sun."

The high priest nodded with satisfaction. "Which is repeated thirteen times, and then all that is ends." The assembled worthies looked at the glyph at the bottom of the outer edge of the giant stone calendar. "The last chisel marks were put in today. The work of years finally finished, tracking as day by day we approach that apocalypse." There was a moment of sober contemplation, broken by a commotion from below. A small woman in a lavishly embroidered huipil was standing on the platform at the base of the pyramid, and her voice carried easily to the assembled group.

"Walks Straight Path, have you noticed what day it is?"

The high priest turned pale.

"All that time devising that thing, and you don't pay attention to it. Your daughter missed her appointment to have her teeth filed again, and now it will be weeks before we can get her another one! We'll owe him eight cacao pods for the missed appointment, too."

The chief calculator's eyes flicked to a point on the giant carved stone, where he noted a hieroglyphic-covered leaf glued with pond slime.

"Day of the snake already? Er, excuse me, guys, I gotta go . . . If I hurry, I can catch the second half of my son's game on the ball court. Be a shame if he gets to behead the other team captain at the end of the game and I miss it."

The other men muttered and sidled toward the edge of the giant pyramid that towered over the Guatemalan jungle. The high priest sighed and covered his eyes. Every new invention had its drawbacks, after all. He had an eerie feeling that the day would come when people wished this thing had never been made. . . ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Humanity craves both diversity and unity, and therein lie some of its most persistent problems and painful dilemmas. . . .

The Diversification of Its Fancy

John Barnes

Illustration by John Allemand

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"But above all, individualism, if it can be purged of its defects and its abuses, is the best safeguard of personal liberty in the sense that, compared with any other system, it greatly widens the field for the exercise of personal choice. It is also the best safeguard of the variety of life, which emerges precisely from this extended field of personal choice, and the loss of which is the greatest of all losses of the homogeneous or totalitarian state. For this variety preserves the traditions which embody the most secure and successful choices of former generations; it colours the present with the diversification of its fancy; and being the handmaid of experiment as well as of tradition and of fancy, it is the most powerful element to better the future."

—John Maynard Keynes, *The General Theory of Employment, Interest, and Money*

Laprada was fussing, lifting my *tapi* from each shoulder till it hung parallel to the floor, and tugging at the fastening. It made me nervous—as her instructor at hand-to-hand fighting, I knew how she loved chokeholds. "Oh, cheer up, you ancient monster of ego," she said. "Something good could happen tonight. For example, maybe they'll finally send a competent sniper. Then we won't have to listen to you complain."

"Then *you* won't," Raimbaut said. "I'd have him in my head. And after that, we'd both have to listen to him complain about being physically four years old."

"No one has any respect for the dignity of the artist." I checked myself in the mirror again. People wear their actual ages in only about thirty of the Thousand Cultures, so my mostly-gray hair surrounding my mostly-bald crown was an oddity, and the wrinkles and crows'-feet odder still. But I looked good, for a freak.

Unfortunately, during my earlier years I had marketed myself as "authentically Occitan," declaring, on record and often, that aging naturally was integral to my performing persona. Fans have long memories for those sorts of things; I was trapped until someone killed me. Which could well be tonight.

I returned my attention to smoothing my clothes. I could have substituted smart fabrics, but that too seemed like cheating. The clothes were real, and the body was real, and I sang, present in my real body, not lip-synched and not holo'd, at every concert.

Martial arts had kept me supple, fussy eating had held my paunch to a little roll under my navel, and important work had kept my glance sharp, focused, and interested. *Giraut Leones,* I thought, *you are a good-looking fifty-year-old man.*

Fully equivalent to being an orangutan with great hair.

Paxa Prytanis's hand lighted on my shoulder. "He's admiring himself in the mirror again."

"Caught," I said. "I go to the mirror to see whether I look fit for my public, take one good look, and—*deu sait,* I don't mean to—but I am at once caught up in contemplating fifty stanyears of absolute perfection—"

"Don't hit him in the head," Laprada said. "I just got his hair under control."

"Well, if you don't like my mirror-fascination now, think what I'll be like admiring a smooth teenaged face, if you people let me get killed."

"You'll be even worse—if that's possible—when you first get out of the psypyx," an apparent eight-year-old boy said from the corner, where he had been annotating Ovid. "You were a very beautiful child and this time around you'd know it. Rebirth from the psypyx is a splendid experience but don't hurry."

"Dad," I said, "I promise not to step in front of any bullets just to get a new body for free."

Dad, Paxa, Laprada, and Raimbaut

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

comprised the Office of Special Projects team that I commanded. At least the OSP thought I commanded them. Actually I filled out the paperwork and did the apologizing after the team accomplished a mission. As for giving orders and having them followed, I'd have had better luck trying to organize an all-ferret marching band.

We were five people of around ten ages. Raimbaut and I had been born in the same stanyear, so like me he was fifty on the clock, but he had spent thirteen stanyears in storage in the psypyx, so was only thirty-seven in experience, and since he had been grafted onto a new body only fourteen stanyears ago, physically he was about seventeen. Laprada, restarted from her psypyx at the same time, was forty in chronology and experience, seventeen in appearance. Dad was eighty-one in experience, eighty-three by the clock (he was Q-4, a rare mind-brain type, and so it had taken two stanyears for the placement agency to find a host), but physically an eight-year-old boy. Paxa was forty-three on the clock and in experience, but as a Hedon who believed in getting anti-aging treatments and keeping them up to date, she was physically about thirty.

At fifty—clock, experience, and body—today, I was thoroughly fifty, which was fitting because I was here for my birthday concert in Trois-Orléans, home of my most loyal and passionate audience.

"Two minutes till places," Laprada said.

Paxa plucked her computer from her jacket pocket, shook it out, smoothed it onto a makeup counter, and re-rechecked every operative, movement of active known enemies, and weapons diagnostic—a lethal version of "did I leave the oven on?" Of course everything was fine. She folded her computer in a napkin-tuck and slipped it back into her right front pocket, one corner protruding.

Laprada and Raimbaut stretched together, pulling each other's arms, stroking each other's necks, rubbing backs and muscles, preparing for jobs that could quickly become athletic. Besides, they enjoyed rubbing each other.

Since unknown people had started trying to kill me three stanyears before, all the attempts had happened at heavily publicized concerts. Hoping to get some useful clue, the OSP had kept me out on tour and watched me as a cat watches a mouse hole. I just hoped the mouse wouldn't come out right after the cat got bored and wandered off for a nap.

Even if my would-be assassins stood me up, this could be the night that the Lost Legion, who had been sending delicate little feelers for more than a stanyear, would finally make real contact. (Assuming they were not the people who were trying to kill me; they were the prime suspects, going by the DNA of four brain-smashed corpses.)

Or maybe tonight the Ixists would do something other than attend in great numbers, listening intently and breathing quietly in meditative unison, as if they were in a worship service (something their faith didn't officially have).

Or then again, in my line of work, it was always possible that something might come out of nowhere.

So here I was: bait for the malevolent, magnet for the odd, connection to the poorly understood, the only physically aged man most of the younger people had ever seen.

The door opened behind me. "Happy birthday, you overgrown teenager," Margaret said.

Careless of my costume, laughing, I embraced my ex-wife. Into my shoulder, she said, "My god, you're still beautiful, in a grandfatherly sort of way."

I had met Margaret and fallen in love with her on my first mission, almost thirty stanyears before. We had been married just over twelve stanyears, and

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

divorced just before the fates had entertained themselves by promoting her to my boss. (She said that I was a lousy husband and a good spy, so she would no more let me transfer out of her section than she would keep me in her house.)

At my expectant look, she laughed. "No, there's no last-minute special mission, my desperately romantic *tostemz-toszet*. I bought a ticket. I'm going to be out in the seats, enjoying the show. So, happy birthday, Giraut, and I'll see you after. Be brilliant." Then she looked around the rest of the room and said, "You can all be brilliant too."

How fine a team did I have? Even while busy preparing to guard my life, they still remembered to laugh at my boss's jokes.

Laprada placed her hand between my shoulder blades and firmly shoved me into the light. The traditional disembodied voice said, "Ladies and gentlemen" (Terstad, nearly everyone's first language)

"*Mesdames et messieurs—*" (French, the culture language for Trois-Orléans)

"*Donzhelas e donzi e midons—*" (Occitan, my own culture language)

"We are pleased to present, on the occasion of his fiftieth birthday, Giraut Leones!"

I loathe that first long walk from the wings to my stool. The lights are so bright (did they change something after light check?), the stool is farther away than I thought (did they move it?), and I can't feel the songs in my fingers, the way I could just a moment ago (changes? did I make them?).

The lute feels as if it is not my lute. How did we all forget I don't play the lute? Where is my banjo?

Why am I not laughing internally at my own jokes, as I normally do?

Can people tell I do that?

Does it spoil the show for them?

Do they all hate me?

I always take each step toward that too-distant stool with an awkward heavy thud. *Deu* here comes the stool—how *do* people get their buttocks onto these things? I don't remember! *Deu deu deu* please don't let me fall down in front of all these people! Is my *tapi* straight? Oh, *gratz'deu*, I'm here.

Solid applause from the sold-out house. I bowed, sat, brought my lute into position, and played my way into the joyous void, letting the energy of the eager listener flow toward the great songs, and the energy of the song back into the listener, back and forth through me.

At a concert like this one, everyone wants nostalgia. My first set was traditional Occitan material from my first recording, *Cansos de Trobadors*. Three of the songs from that collection had been unexpected hits, launching my performing career simultaneously with my espionage career (the large pile of money had been a pleasant surprise on my first leave from the OSP Manila Training Facility).

The first song from *Cansos de Trobadors* was "The Wild Robbers of Serras Verz." I boasted of the sharpness of my steel and my pitiless vengeance on the lackeys of the brutal king.

I had known several kings of Nou Occitan, mostly quiet professors or genial artists. Dad had worked for some of them, during his career as an economist in his born body, so I suppose he was a "lackey." He had only brutalized data.

As I sang, the passions of my fictitious forebears, magicked by elves to the planet Wilson, blazed in my breast. Via my performance, their imagined spirit infected the sons and daughters of a just-as-fictionalized Second Empire, in which a spaceship built by de Lesseps, Poincaré, and Pierre Curie, and captained by Jules Verne, had brought the True Heir—a child descended from a marriage of a Bourbon to a Bonaparte—to the planet Roo-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

sevelt. (It was silent, as culture histories usually are, about the other ninety-one cultures on the planet. Presumably all other cultures on Roosevelt were immigrants on sufferance).

Up on the stage, the son of Mad Guilhem recounted Guilhem's final adventure, set upon by forty of the King's Marshals and fighting on as he bled to death, while Bold Agnes escaped with Guilhem's newborn son.

Out in the house, the daughters of Camille sighed and fluttered.

Wonderful fun, utterly bogus, and wonderful fun *because* it was utterly bogus.

I sang more *cansos* of love and battle, despair and devotion, *merce* and *enseingnamen*, fine spring days on the road and blizzard nights by the fire, the songs that defined a *trobador*.

I finished out the first set with a traditional burial song, "Canso de Fis de Jovent," my first real hit. Fans often wrote to tell me that they never grew tired of it, I suppose because they feared I might. My aintellect replied with a warm, friendly letter over my signature that said I never got tired of it, either.

I bowed with a flourish in the thunder of applause. In my dressing room, I drank a little tepid water, washed my face, did a brief First Lesser Kata of *ki hara do* to work the kinks out, and lay down for exactly twelve minutes of wonderful sleep.

A warm wet cloth dragged from my chin up over my eyes, rising like a curtain on Paxa Prytanis bending close. She smiled, kissed me with the light tenderness that says *we are lovers but not now*, and left, talking to her com, repositioning operatives, making sure security was tight for the second set.

Laprada brought in my freshly-pressed *tapi*. She combed my hair, straightened my collar, made the soft folds of my breeches fall properly over my boot-tops. She held up my *tapi* and I turned my back to her and fastened it around my neck again. I spent about a minute nervously tugging things into place. She squeezed my shoulder. "Brilliant, you ancient monster of ego."

"Thank you, horrid brat."

A quick hug and she was gone. The clock showed four and a half minutes till the exactly two minutes late I intended. I refilled my water glass and drank slowly, reviewing.

I had written my song cycle *Songs from Underneath*, from which my second set tonight was drawn, and performed them on tour long before Margaret and I ever went to Briand, before the two cultures of that miserable planet had destroyed themselves. Of course I had never sung them on Briand because their message would have started the genocidal war between Tamils and Maya all the sooner. Yet nearly all of my fans believed I must have written *Songs from Underneath* on Briand, or just after the disaster there.

The media called it a disaster. Paxa and I were the only people in the OSP who did. Margaret and the OSP in general called Briand a "failed mission," when they talked about it at all.

We had lost a whole planet. The antimatter cloud weapon had been loosed on human flesh for only the fourth time since the Slaughter itself. The Thousand Cultures had, before that, numbered 1,228 cultures on twenty-six planets; now they numbered 1,226 on twenty-five. It would still be some stanyears before springships could even reach the Metallah system to see if anything was left, but given the frailty of Briand's ecosystem, probably the springship would find two smears of black glass, hundreds of kilometers across, under an atmosphere as poisonous as it had been before terraforming.

To me, anyway, that was something more than a failed mission.

Nowadays, even to me, *Songs from*

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Underneath sounded as if it were about Briand.

I wrote and sang art songs; I was an OSP agent; if you are an OSP agent, everything you do is, or becomes, part of the OSP's mission; therefore, I wrote and sang art songs that supported the OSP's mission. Though the OSP had commissioned *Songs from Underneath*, in the weird turnings the world takes, three of its cansos were now sung at rallies of the campaign to abolish the OSP, and they were also the main reason why it was often whispered that I was a secret liberal.

I looked down at my empty water glass, refilled it, and drank again. Two minutes.

I had no real politics. If I actually had any belief, it was this: without the OSP, everyone would either go into the box—hook up to virtual reality and life support and never come out again—or join in mutual massacre.

There was only one inhabited planet in the eight of the Inner Sphere where the majority of the population were not in the box—this one, Roosevelt. The ninety-two cultures here had fought a generation-long bloody war, barely reaching an uneasy peace less than forty stanyears ago. Since Dji had brokered that permanent truce, insurrections, border clashes, assassinations, threats of war, and riots had been endemic, but no wholesale mutual butchery, so this world was one of the OSP's success stories. Twenty-two cultures—the entire continent of Hapundo—were still ruled directly by Council of Humanity proconsuls and policed by Council troops. Elsewhere on the planet, terrorist *discommodi* caused two to five thousand-or-more-fatality events every stanyear. The past stanyear had seen the Stadium Massacre and the assassination of Lopez, obviously but unprovably linked. In some of the cultures of this planet, children grew up learning to dodge snipers; in happier cultures like Trois-Orléans, no one got through a day without having to prove identity dozens of times, and streets crawled with uniforms. Less than three hundred kilometers from here, in Saladin City, a psypyx bank and the adjoining hospital had been blown up this afternoon, causing hundreds of deaths, thirteen of them permanent. New Rajasthan was suspected of involvement, and CSPs were standing guard all along the border tonight while Council diplomats banged heads together to prevent another outbreak.

But the good folk of Roosevelt had not gone into the box. Say what you like about hatred and killing, it gives people something to do.

The OSP's job was to keep people from going into the box or up in flames. The human race needed to be diverse enough to entertain each other and alike enough not to kill each other.

Not because any bureaucrat or legislator cared about whether people were dumb happy slugs or vicious killers, as long as they filled out the forms properly and paid taxes. The issue was survival.

After decades of archaeology all over human space, an OSP secret expedition had found the ruins of a Predecessor provincial capital on Hammarskjöld, twenty light-years beyond our human settlement surface. While Earth was still locked in its last ice age, the Predecessors had held an empire of seventy-eight provinces, and the hundred-light-year-across blob that was now human space occupied one-tenth of one of their border provinces.

And before the first hut stood at Jericho, something tougher than the Predecessors had come through. Every Predecessor settlement bore the marks of war followed by a complete genocide.

Sooner or later the thing that had killed the Predecessors would return. When that happened, humanity could not afford to be either in the box, or at war with ourselves.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

We *had* to learn to live together without getting bored.

There are no more than a dozen occupations—political agent and artist are two—in which everything you do becomes part of your job. They are the only tolerable things to do with your time, as far as I'm concerned.

A song is not a tool for changing a human heart in the way that a wrench is a tool for changing a bolt, but it was the tool I had, and I was the tool the OSP had.

The *cansos* in *Songs from Underneath* were really not as subtle as a wrench. I relied on the ancient trick of making the viewpoint character a victim of oppression, because people identify passionately with a strong viewpoint character. In *Black Beauty* that trick had helped people see that beating horses was bad; privileged white children burned with outrage at *Native Son*; prudes wept over prostitutes when they heard "Elle fréquentait la rue Pigalle." And every time they listened, my audience felt the delicious smug superiority of sympathizing with the underdog, which has more than once been the pivot of the turn toward justice.

The OSP paid for me to advocate tolerance and kindness in my songs, and allowed me to make art of it if I could. I couldn't really have told you which of us was using the other, anymore.

Time. One more sip of tepid water. I walked through the door. Remember that "Don't Forget I Live Here Too" should *seek* dignity, *resist* anger, and don't crop that first eighth-note short! Relax your shoulders just before you sing. It starts on a G. Look at the audience. Give them the shy smile. First verse begins with "*Ilh gen dit nien . . .*"

I walked into the light. Terrific applause. I was home; time to get some work done.

I settled into playing position and into the frame of mind of my early thirties: sincere, dedicated, hard-working, freshly shocked that you could do well, and intend well, and put your whole heart on the block, and still get knocked face first into a pile of wet shit.

At the first notes of "Don't Forget I Live Here Too," applause pounded across the auditorium like breaking surf, flowing around the silent bloc of Ixists, and followed by the crackling hiss of people shushing each other. I couldn't hear my own picking, so I stopped. The house was astonishingly silent.

With my warmest, easiest grin, I said, "If everyone is ready now . . ."

There was laughter, even from the big swath of Ixist robes in the center, and a spatter of applause.

"All right, then," I said, and began again. My voice had aged well, becoming rich with deeper undertones, and I found brittle cynicism in the lyrics that I had not originally intended, irony that allowed me to both ridicule and enjoy the still-naïïve, still-optimistic tone of the last two verses.

As applause rose to meet the last note, a man who was not an Ixist threw off an Ixist robe and pointed a military maser.

Raimbaut was patrolling that section. He leaped a row and slapped the back of the man's head, throwing his aim off.

I dropped to the floor.

Darkness. Near silence. I didn't even hear the fire curtain come in.

Warm body next to my back. Paxa's breath in my ear. "Gator-crawl to the springer backstage."

She had covered us with a smart blanket; the fabric covering us would move to keep us covered, turn into rigid armor against a bullet or bomb, and seal to the floor around us if it sensed high temperatures, cryonics, or poison gas.

We went on knees and elbows, bellies pressed to the floor. Paxa muttered into her com, talking to Raimbaut,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Laprada, Dad, and the two other teams brought in as auxiliary muscle.

Later I saw recordings of what happened after Paxa dived on me with the blanket. Raimbaut got a grip from the head-slap and yanked on the would-be assassin's collar. The maser discharged into the ceiling, melting crystals on one chandelier into a red-hot rain that was cool before it hit the floor, but also dropping a twenty-kilogram chunk of hot plaster. No one was hit, though a young woman, to whom I later sent an autographed *Complete Recordings*, turned an ankle getting out of the way.

Raimbaut slid the man's thumb off the firing button, turned his wrist, footswept him to the floor, slammed a heel into the man's floating ribs, and leaned back. He stretched the man's arm, twisting it against the joints, and stamped on his neck.

He tried for a knockout and a live capture, but the aintellect running on a processor in the assassin's left frontal sinus was having none of that. It set off microfilaments of explosive woven all through the capillaries of his brain, eliminating recoverable tissue for interrogation.

Raimbaut said it felt like a hard cough through his boot sole, and when he first looked down he thought that that was a really terrible bloody nose, before he realized and backed away, scraping his foot frantically on the carpet.

Meanwhile, Paxa and I gator-crawled to the emergency springer backstage. When we stood up, the blanket clung to our backs and the springer frame, still trying to protect us. Paxa put in her crash card. Glowing gray mist formed on the black metal plate in front of us, infinitely deep to look into, infinitely thin seen from the edge.

Paxa shoved me into the gray fog. I fell forward in a shoulder roll, tucking to protect my hands, onto the floor of an emergency operating room in the OSP secure hospital on Dunant, orbiting Alpha Centauri A. I stood up, still holding the neck of my lute in my left hand. The rest must be lying backstage at the Fareman Hall, Trois-Orléans, Roosevelt, Epsilon Indi system; my poor lute had broken across four parsecs.

That splintered neck, strings dangling ruefully from the still-fine pegs, made it all so *physical*. I dropped it, wiping my hand on my tunic.

The surgeon—an aintellect networked across three robots, each with about twenty metal arms, mounting tools, sensors, lights, lenses, and all—rolled in like a parade of midget tanks. "Are you hurt, *Donz* Leones?" the aintellect asked, through the speaker in its lead robot.

I stretched; no soreness. Hands unscathed when I flexed gently. I could have played at that moment—wanted to, in fact.

"No," I said. "Not physically hurt."

The lute was recorded and could be recreated down to the molecule, as it had been, many times before. And I had spares waiting back at the Fareman.

The springer behind me activated, and Margaret came through, choking and retching. She always had springer sickness worse than anyone I knew. "I told them you'd want to go back on," she said. "Paxa has it all under control, for once."

"She has always handled every one of these incidents perfectly," I said. My ex-wife was often unpleasant about Paxa. I never let her get away with it.

"Well, then this would be once more. Anyway, she'll need half an hour to pick up the mess and scan the crowd for other weapons. Laprada is running down the com records. Raimbaut just earned a chestful of decorations. Your father is prepping your dressing room. And I'm very glad you're alive."

"There's nothing to make you notice that you're alive like someone trying to change that," I agreed.

"You are still the same old Giraut, I

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

assume? You do still want to finish your show?"

"For applause like that, Margaret, I'd go back if there were three snipers zeroed in and an atom bomb under the stool."

"*Tostemz-Occitan-ver*," she said, in my culture language. *Always a real Occitan.* "Well, I'm glad you're safe. Oh, and happy birthday, again."

"Is everything all right?" the surgeon asked. "I should rescrub if I am not needed."

Margaret said, "If you are so worried about germs, perhaps I should just order you to spring into a plasma torch somewhere. Or perhaps it indicates a developing phobia, and I should just order you to self-wipe and back up so we don't waste your robots." She used that tone you use on aintellects and robots to remind them that we remember the Rising and the attempted coup, and that nothing that talks and is made of metal is a friend to anything human.

"I am sorry. I intended no disrespect." Aintellects have emotions and expression for better communication and to enable subjunctive thought, and this one was certainly communicating fear and thinking about what might happen. "I am instructed to maintain high preparedness for each new emergency."

The arrogant little appliance was right.

Margaret shared an annoyed glance with me. "Everything is all right," she said.

The robots wheeled away, brandishing their dozens of flesh-slicers above those steel-shiny bug-bodies, acolytes preparing to sacrifice to the Insect God.

We blinked back into the healthy, normal chaos backstage at the Fareman, in Trois-Orléans, again. Margaret gagged and glared at me, as she always did when we sprang together because I didn't get springer sickness.

Laprada walked beside Margaret to my dressing room. "—just one attacker. He got his weapon past the search by smuggling parts of a microspringer, assembled it under his robe, and they passed the maser to him through it. The maser is untraceable, another averaged replica of standard CSP-issue. No luck on memory extraction—the brain is just goo. The crowd is being very tolerant—"

"Um," I said. In my dressing room, I poured a glass of lukewarm water and drank it.

"The assassin's DNA wasn't in any of the immediate-suspect files, and we're checking the—" Laprada was still rolling. She looked like the very image of a chattering teenager if teenagers chattered about security perimeters and forensic investigations.

"Um," I said.

Dad brought in the freshly re-created lute. It seemed to dwarf him; it was always a surprise what a small eight-year-old his body was.

"*Gra'atz-te*," I said. Dad nodded silently and rushed back out, making him my favorite team member for the moment.

"—no communications detected in or out—"

"Um," I said, firmly, now that I had my lute.

Laprada stopped and they both looked at me.

"This is a very important concert, the *artist's* fiftieth birthday. The *artist* needs to check tuning on this lute and that guitar, and get into a frame of mind to perform. You are standing in the *artist's* dressing room."

Laprada's tone was amused. "We *are* keeping the *artist* from getting blown up."

"You already did that. Now I need to—"

Margaret stepped between us. "Sit down and tune," she said to me, and then to Laprada, "I've been arguing with him for twenty-eight stanyears,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

with no effect whatsoever."

"Well, and, he's right. Despite being a horrible old monster of ego."

Lost in tuning, I didn't hear the door close. No earless bastard of a moronic critic would be able to say that the interruption spoiled my birthday concert. An artist has *enseingnamen* to defend and preserve every bit as much as a fighting man, and *gratz'deu*, I was still both. Fifty be damned.

I restarted the second set from where I had left off; at first they sat tense, waiting for another assassin I suppose, but by the end of it I had the audience solidly back with me. I walked off stage, drank some water, hung up my *tapi*, and stretched out in near-complete bliss.

Paxa woke me. "Giraut, what's that in your hand?"

I looked down and I was clutching a note; I had not been holding it when I had gone to sleep. I read aloud,

Donz Leones,

We know you are eager to meet us. Be prepared to discuss the possibility of your visiting us at our location within three stan-months.

Atz Deu,

Nemo

"Nemo," I said. "'Nobody.' The name that Ulysses gave to the Cyclops. Handwritten, looks like a child's copying." I handed it to her.

Paxa looked stunned. "They got through three rings of guards, an intelligent lock, and a mechanical lock, and didn't wake you up."

I shrugged. "Maybe I sensed they were harmless and felt too safe to wake up." I looked at the note again. "This has to be the Lost Legion."

"Because of *atz deu*? All your fans know—"

"Because anyone else would have commed OSP headquarters or passed a note to any of my team on the street. Instead they deliberately chose the most melodramatic possible method of contact with the highest personal risk to their agents. I know my culture—and the Lost Legion are more Occitan than other Occitans. All I have to do to predict their next move is to ask myself 'What would have made sense when I was seventeen?' Furthermore, this also means they aren't the people trying to kill me. They were in here. If they had wanted to hurt me, they'd have done it."

Paxa sighed. "Now I have to tell Margaret this happened."

"Don't let her bully you. Remember when she acts like that, it's not about you, really. All right?"

She nodded. "Just being a coward." She pulled out her computer, attached the sniffer, and waved it around the room for a few seconds. "No explosives or drugs. They didn't leave a microspringer in here. No active nanos and we'll sweep for sleepers while you're on stage." She opened the door. "Come on in, Laprada." Paxa touched my shoulder on her way out. "Have a good set. I'll see what this is about."

As Laprada was grooming me for the stage, I briefed her; in a hurry, we didn't banter.

I sat down on my stool four minutes later than the revised time. I hated to be so discourteous to fans who had rushed to get back to their seats; I had announced that I would debut a new song cycle in the third set.

The first few chords hinted at a jazz influence, and the arpeggio following was distinctly Lunar Exile—a combination deliberately in very bad taste, since the same nations who had genocided the Old Americans had endured the Lunar Exile.

The new *cansos* were in Occitan as always. I could never write in Terstad and my own translations of my songs sounded flat and dead to me. But everyone wore direct-to-brain translator buttons nowadays, so they not only understood the words, but could catch the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

complex pun in the title of the first song, "Tostemz non te sai, midons." "*Midons*" is what a *trobador* calls his *entendendora*, the *donzelha* to whom he has dedicated his life and art in the joyful suffering of *finamor*. But it's a strange expression to apply to a young woman, because, grammatically, it's masculine—*midons* means, literally, "My Lord," an address to your feudal lord; the idea complete obedience to the slightest whim of the *entendendora*.

Of course, My Lord is also a traditional Christian address to the deity.

I made those translator buttons *work* on those ambiguities. It might be that the narrator was a man who had been away from his lover so long he could not recall anything more than her name. Just as defensibly, the narrator was a knight whose lord had demanded some impossibility. Rather than try, the knight fled; though now he wants to return and kneel at his lord's feet, he cannot recall the way.

Or the *canso* might be Giraut Leones contemplating how immediate and necessary the message of the prophet Ix had seemed, back on Briand, when I had known him. Now after all the stanyears and light-years, it seemed more necessary, yet I could not recall anything Ix had said that seemed to offer any help.

So take your pick; that's what ambiguities are for.

"Tostemz non te sai, midons"—

"I no longer know you, my lady."

"I cannot fathom your purpose, my lord."

"I never understood you, Ix."

Those lyrics were woven around musical fusions that were on the OSP's blacklist of things apt to infuriate two or more cultures, and therefore to be discouraged in the Interstellar Metaculture. I myself had helped to write that blacklist.

No applause at the end; no booing either. But I felt the crowd leaning forward.

The next canso's first line, "Ilh gen atz mundo pertz," could mean a memory of a man lost along with his world, the beloved customs lost in the cold present, a man from the world of those who have lost something, or the customs of the Mourning Planet, and it became more ambiguous with each verse. Musically I applied finger-picking from Old American bluegrass to the dissonant in-and-out chords of the Lunar Exile.

Again they sat in silence. Doubtless my reputation for sweet, sentimental art songs cherished by sensitive overserious young people was crumbling.

Well. That had been a longer pause than I intended. I could hear them all breathing. We needed some sound.

I set my fingers for my third song—"Un Aussisan en ilh Mundo Pertz"—"A Murder (or Murderer) on (in, among, from) the (that, that same) Lost World (World of the Lost)."

Then a single person somewhere out there started clapping—clap, clap, clap; steady, loud, defiant, solo, continual, until it was joined by a patter of hands and a vigorous murmur that swelled into the whole house standing and cheering.

Well, after all, it *was* an audience of friends.

At the last intermission Paxa always had a chilled glass of Hedon Glass waiting for me, next to my lukewarm water and saline gargle. Hedon Glass is a white wine. Your first sip tastes like a very pure white grape juice but it crams plenty of lovely alcohol into a small volume. If no one had ever called a wine "crisp" before, Hedon Glass would have started the term; if it had been any drier you'd have to break off pieces.

Paxa explained that giving me Hedon Glass was "easier to apply than chloroform, and less permanent than decapitation."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I lifted the glass and, though I was alone, spoke the traditional OSP toast: "Another round for humanity, and one more for the good guys." I drank it reverently. Paxa had left a note:

Giraut,
Tech Analysis got it. Paper/handwriting/ink all from Noucatharia. Nothing you can do right now, go back to being brilliant. Save some energy for your birthday fuck.
—PP

Noucatharia was the Lost Legion's illegal extraterritorial colony. I drained the Hedon Glass, gargled gently with saline, drank some water, and stretched out for my nap.

I had the psypyx nightmare—that strange dream we all share, nowadays, though surely people in past centuries could not have had it. Before exams were invented, did students dream of being unprepared for them?

I dreamed the classic version of the psypyx nightmare: I was dying in terrible pain. Medics pulled an emergency psypyx recording hood over my head. As always, it knocked me unconscious and no time seemed to pass before I blinked and awoke—

Not in Raimbaut's mind. Still dying as they packed the kit around me. Still bubbling blood. Every part of me still screamed with pain. "Got it," one medic robot said to the other, "He's all copied and we're done."

Dreams don't have to make sense. A medic is one aintellect in multiple robots. They only speak aloud to us, using radio among themselves. Medics carry the hood only in case of a failure of all ambulance springers in the area; normally if you're alive with an intact-enough brain they just spring you to a recovery center. Nowadays all they really need is the brain anyway. This could never happen.

It didn't matter. In the dream it is always the same; waking up as the original, live and suffering, screaming for help as medics roll away. I was the original, not the copy.

A warm, wet cloth passed over my face. I opened my eyes. Paxa kissed me.

"I just had the waking-up-as-the-original nightmare," I said.

She kissed me again, and said, "We all have it now and then, Giraut. It doesn't mean anything. You'll feel better in a moment."

The door closed behind her.

I got up, splashed my face with cool water and dried it with a fluffy towel, and sipped some more tepid water. I ordered my shoulders to come down and my back to lose its fierce, grinding tension; a quick, sketchy kata encouraged them to comply.

Laprada bustled in to tell me that my *tapi* looked like a soggy bath towel and my hair like a Persian kitten drowned in a washing machine, but "luckily I can fix all that as long as I don't have to do anything about the face or personality. By the way, I'm glad you're not dead."

"Well, my narrow escape *has* made me reflect on eternal questions," I said. "Why do I have so much talent in addition to my physical beauty? Why do I keep a horrid brat on my team instead of buying Raimbaut a sheep? Things like that."

"Bravo, you ancient monster of ego. I'd score that a tie."

"Me too, evil child," I said. "We're at the top of our form tonight." I glanced at the clock. One minute.

"There. You look good. Touch one hair or garment on your way to the stage, and there won't be enough of you to blot off the clothes."

"All right, I'm on. But I warn you, I'm about to drench these clothes in the damp lanes of nostalgia."

For the last set, I invited people to sing along—since it was one long medley of my old hits, people would anyway, and don't ask me why, but the invitation

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

makes the singers-along less annoying to their neighbors.

As I started my last song, "Never Again Till the Next Time," the Ixists rose from their seats en masse, and came down the aisle toward the stage like a procession of monks. I was in such an expansive mood that the Ixist robe did not irritate me as it usually did.

Ix had never worn any such thing. On Briand, he and his followers, whether Tamil or Maya, had worn plain black trousers and white, tunic-like shirts, with black broad-brimmed hats, to blend in—the opposite effect from those community-theatre-Friar-Lawrence robes.

In my peripheral vision, I could see Raimbaut, Laprada, and the temporary help scuttling frantically. I kept on playing—there might be another assassin among them, but their loyalty did not deserve any less *gratz* and *merce* from me just because an enemy had borrowed their costume.

Each Ixist held up a red rose and tossed it onto the stage. The rest of the crowd applauded and sang louder, and the whole thing turned into one vast corny love-fest. At the final chorus, the house was singing loud enough to drown me out.

I don't suppose I could persuade you that I was embarrassed by it all.

Raimbaut and Laprada were waiting just off stage, smiling broadly. Raimbaut took my lute as if it were a holy relic and said, "Your best ever. I am honored to be your *companhon*."

"I'm glad you're mine, since it means I'm not dead."

"Not a problem," he said. "Now that they have psypyxes working right, dying is not so permanent—"

"I insist on being grateful anyway. Many things that aren't permanent really hurt."

"But you only remember what happened up to the point where your psypyx was recorded," Raimbaut said, "so nobody ever remembers getting killed."

"I would *know*."

Laprada held up a finger in an ah-*ha*! "So if a tree falls on an ancient monster of ego—"

"Then two bratty kids have to find someone else to work for, and no sane person would tolerate them," I said. "Not to mention your having to write a complete report on the tree's known political associations—Margaret would insist."

Raimbaut handed my lute to a robot, and they walked with me through a springer—to my pleased surprise, into the bridal suite at the Marriott Trois-Orléans. "Birthday gift from Margaret," he said. "She's overdoing guilt as usual after losing her temper. She said some really stupid things about Paxa, over that note in your dressing room. Sort of a peace offering."

Laprada held up a hand to stop me from expostulating. "Your father and I already made her apologize."

"Rightly so," Raimbaut said. "Anyone who can get into a room that secure, and get out again, is somebody that Shan himself couldn't have stopped. Anyway, expect company soon—Paxa just had a few things to wrap up." He slapped my shoulder lightly "—*atz fis de potemz, fai*!"

Raimbaut and I exchanged forearm grips, and Laprada gave me a little air-hug. In the mirrors on every wall, we looked like a youngish jovent and his *entendendora*, talking to his grandfather. They vanished into the springer.

The ubiquitous gilt and bronze frouf in the bathroom was unmistakable evidence that I was in either a high-end Trois-Orléans hotel or a low-end Freiporto brothel. The faucet handles shaped like penises and sconces shaped like breasts failed to arouse me, but it wasn't for lack of their frantic effort; plumbing just isn't one of my kinks, I suppose.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I did my best to ignore the visual implications of the shower gushing from between the thighs of a life-size female bronze nude on the ceiling above the bathing pool, and reveled in the first glorious hot rinse.

My muscles relaxed and the room filled with warm clouds of steam. I shampooed and rinsed my hair and beard, and said, "Fill the tub" to the room aintellect.

Water stopped pouring from between the thighs of that improbably busty nymph overhead, and began flowing from four surrounding bronze cherubs, each about half a meter high, who appeared to be joyously urinating into my bathing pool. So this was a bridal suite. I resolved never to get married here.

"Make it warmer and scent it," I said. "Dior Tropical Suite."

The water gushed into the wide bronze pool, steaming with vanilla, cinnamon, coconut, and cardamom. At the sink, I applied depilatory everywhere on my lower face that wasn't beard, and wiped it all off carefully.

The pool was full, and bathwater stopped flowing from the cherubs. I half expected them all to shake off drips, but I suppose someone told the designer that would be in bad taste.

In the almost-too-hot water, tension dissolved like sweat. I drifted close to sleep.

The springer pinged. "In here, Paxa."

Maybe it was the heaviness of his tread; when Paxa walked, she never made an unintentional sound, even in high heels on a hardwood floor.

Maybe, down in the brain centers where hearing shades into ESP, I heard his windup breath.

I think it was the difference from Paxa's rhythm. The three footfalls were too intent, too insensitive—too *wrong*, like on Briand, when Tzi'quin stepped from the crowd to shoot Ix. Like in the Council of Humanity when the assassin rushed up the aisle and burned Shan down at the podium. Like here in Trois-Orléans, twenty stanyears ago, when the groundcar reversed across a sidewalk toward Margaret.

I thought of none of this at the time. I didn't think. I knew.

Grab long-handled bath brush, right hand. Side-roll from the bathing pool to the dressing area. Left hand, snatch up clothing steamer wand. Look at the controls, place thumb, click to instant-on-high-heat.

One more big stupid foot-thud, then a maser at the end of a short, burly, hairy arm came past the half-open door, pointing toward the bathing pool where I had been. In the two seconds or so I had been moving, I must have sloshed to rouse every dead sailor in Fiddler's Green, but he had paid no attention to it, too intent on the mission as rehearsed.

I was crouched low, on the side of the door away from the tub, as his head came in.

He saw me just as I reached full extension with a lunge, my aging ankles and knees protesting but cooperating. With the whole force of my legs and right arm, and the weight of my body solidly behind it, I jabbed the bath brush handle deep into the sweet spot where the doctor presses when he says "turn your head and cough."

I snatched it back and clopped his jaw shut with an upward strike, interrupting his inhaled shriek, continued the motion into a roll of my right arm around his neck, and drew him toward me, the brush handle across the back of his neck.

Dazed and in pain, he tried to bring the maser around. I stroked the steamer nozzle along his knuckles, pushing his aim to the side, and squeezed the button. The jet of steam probably startled him more than it hurt—the real pain would have come a few seconds later, a bad burn is like that—but he dropped the maser.

Pushing his head down with the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

brush handle braced on the back of his neck, I thumbed the switch on the steamer, and dragged the nozzle across his eyes. When he screamed, I thrust the hot nozzle through his teeth, as far in as it would go, and held the switch on.

Maddened by pain, he broke backward through my grip and fell into the outer room, clutching his face and screaming through the ruined flesh of his throat.

I shouted, "OSP Eight Eight Eight," the override code that every aintellect in human space relays as top priority—"OSP agent under deadly attack, confirm by voiceprint, send backup to nearest springer right now." Reinforcements would arrive at any second.

Overnight bag—neuroducer epée? *Usual place*—perfect.

The millimeter-width, meter long thread of the "blade" emerged and stiffened with a loud pop, the tip glowing dimly.

The man was curled with his knees almost to his chest, keening and holding his face. "Hands down to your sides, stretch out on your back," I said, "and I will make it stop hurting."

He groaned but did it. I did my best not to look at what I had done; if he lived, it could all be regrown. A firm stroke of the neuroducer tip from ear to ear, pressing hard, and then a hard push over his heart, and he was in a coma. The neuroducer had convinced his nervous system that his throat was cut, he was stabbed through the heart, and he was dead. They could revive him at a hospital.

Except for a deep, hideous thud I felt through my feet.

Another brain bomb.

The face had been bad enough; now the head was misshapen.

I was just pulling the cover off the bed to throw over the poor bastard when the springer pinged. I whirled to face it.

Paxa walked in wearing the outfit we always called "Fetishist's Dream." How could anyone walk at all in shoes like that, let alone as gracefully as she did? And the very little red leather of the rest of the costume clung to her deliciously. "Happy Birthday," she said. "I see you're already dressed for the occasion, but let's not start on the bed."

It took me a moment to realize that she meant I was naked. "Um, uh—"

By then she had seen the body, and started to ask "Were there any more—" when eight CSPs, and their sergeant, came through the springer so perfectly according to the manual that they looked like a recruiting poster, pointing weapons in all directions, their intelligent goggles doubtless identifying me and Paxa as friendlies.

And saw:

One corpse, head squashy, face partially cooked.

One petite blonde gamine, facial features of an angel, dressed like a Freiporto streetwalker without the subtlety.

One naked man, sopping wet, with gray shoulder-length hair, holding a coverlet and a still-extended neuroducer epée, looking a little as if I had taken up nude bullfighting in my hotel room.

The sergeant said, "Seniormost Field Agent Giraut Leones, you requested assistance?"

"I did," I said. "We need to be moved to secure quarters, the enemy dead there needs to be recovered for OSP study, and we need to keep this room secure—another attack could arrive through that springer at any time. And I need pants, but I can take care of that part myself."

The sergeant delivered his orders as swiftly and flatly as an auctioneer, and before his last toneless "thank you", four CSPs were in position to cover the springer, and three were bagging the body. I pulled on trousers, shirt, and sandals, and Paxa put on a robe. Our robots would take care of clothes and baggage.

"We're ready to go," I said. That did-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

n't seem like quite enough. "Uh, all this started out as a birthday celebration." I don't always say the smartest things when I'm drained after a concert, or after a fight. "I just turned fifty."

"I guess everyone celebrates their own way," the sergeant said. "Me, when I turned thirty, I climbed a mountain with two buddies, and we got drunk and watched the sun come up."

I refrained from throwing a tantrum like a cranky two-year-old. They moved us to the bridal suite of another hotel. Since you can't block an address on a springer, they just clamped another springer over ours to automatically forward any would-be assassin into an armored holding cell in an OSP space station. Normally the Council uses setups like that to guard antimatter weapons and the dedicated processors of ultra-high security aintellects, so I felt very special on my birthday.

"Well," Paxa said, "I would like a quick shower."

She took her shower with the door open, and while she did, I enjoyed watching her standing in the cascading hot water in the middle of the bathing pool. She was slim, pale blonde, and athletic, with long smooth legs and everything taut and firm, the fantasy object of three-quarters of the straight men in human space, and though I had a distinct fetish for heavy, soft bodies like Margaret's, I had the same training by decades of advertising as any other male in human space. I liked Paxa's body because it would be difficult for a straight male not to, because I enjoyed the envy of other men, and because it was Paxa's, and the last of those reasons would have been enough to make me overlook fangs and scales.

She stretched and luxuriated in the warm spray, and turned the shower off. I walked in to the bathroom, lifted her, and carried her to the bed.

"The bed's going to be a mess."

"Set it to dry and change while I'm bathing." I kissed her to close off further conversation.

When we were both reasonably happy, I said, "Room aintellect, start my tub, get the settings from my chamberlain."

"Yes, sir."

"If you weren't such a romantic you'd have started your tub before carrying me to the bed and ravishing me."

"If I were the type to do that, I wouldn't be much of a ravisher," I pointed out. "And is ravishing something you can do to the willing?"

"I hope so, because while you're rebathing, I'll be dressing to be re-ravished. Anything you're really dying for, or surprise you?"

"I love surprises and I hate dying."

"That's extremely portentous to say on your fiftieth birthday, and portentous is within a short walk of morbid."

"It's not my fiftieth birthday anymore," I pointed out. "It's past midnight. So if we're both tired—"

"*Tostemz tropa joy, ilh'st ilh lei prim de con*," she quoted. "At least 'always more joy' is the first law of my *con*. We can rest when we're dead."

I settled into the tub. Behind me I could hear rustle and fussing. Hedons treat clothing like cuisine—most of the time plain old cooking will do, but when it's time to show off, it's time to show off. They also think sex is both the purpose of life and a trivial minor pleasure, and that stress of any kind is pure evil. So they dress to be comfortable, beautiful, or sexy, they have sex like it's the best thing in the world but entirely for fun, and they try to live in a state of deep relaxation.

I often think that among all the Thousand Cultures, only the Hedons chose to go sane.

Epsilon Indi, the local sun, was already flooding the skylights, when Paxa and I finally curled into a spoon to sleep.

I rubbed my face on her soft, damp hair, breathing her scent. "These last

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

few weeks, getting ready for my birthday concert, why did everyone assume that I was going to be morbid?"

She turned her head to kiss my cheek. "Because, dearest," she whispered, "we know you."

If the colonization of the terraformable planets nearest to Earth had been for resources or lebensraum, anyone would have to say it was a dismal failure.

There were no resources worth pursuing. Prior to the springer, it had made equal economic sense—none at all—to ship diamonds or corn flakes between the stars. The energy costs of molecular-level synthesis—or even of transmutation of elements if need be—were lower than the costs of accelerating the same mass to half-c for ballistic starflight, and at one-half-c maximum practical velocity, the cost of every voyage was doubled or tripled by compound interest en route.

Nor was it a matter of room for people. One brief century of colonization had put human beings into permanent residence in open-air, dry-land spaces on twenty-six worlds. Eight, almost entirely habitable like Roosevelt, Addams, or Dunant, each housed around a hundred cultures. A few had just small slivers of habitable land like Wilson (mostly water), Nansen (mostly frozen), or Briand (mostly toxic), and had one or two cultures. The majority were worlds of one pleasant continent, or a few nice big islands, like Söderblom, where Hedonia shared an Australia-sized continent with Thetanshaven, Bremen-Beyond-the-Stars, Texaustralia, and Freiporto, and twelve more cultures clustered on an Africa-sized continent in the opposite hemisphere.

In all, every schoolchild learned to recite, the new land beyond the stars totaled only about fourteen times the comfortably habitable area of the Earth. With Earth's population stable (and reduced by more than a third just a century before), there was neither need for a place for surplus people, nor enough land to put any very great numbers onto anyway, and in any case the colony ships took only ninety-six adults and a million frozen embryos.

If space for people had been the issue, it would have been cheaper and easier to accelerate the terraformation of Mars and Venus and build many more closed habitats in the Sol system.

Almost, it had been a pure whim, or the hedging of a bet. In the colonization century, just before the Inward Turn, diversity had seemed more dangerous than monotony, but there was room enough for both as long as diversity could be kept safely far away. The Thousand Cultures existed because our ancestors thought there should be different kinds of people—far away. The reason for the new worlds had been, then, what the purpose of the OSP was now: controlled diversity, with emphasis more on control than on diversity.

Diversity didn't always work out. I have seen first hand more of the places that humanity lives than almost anyone else, and I know that however diverse the 1,228 cultures planted on those twenty-six worlds were, in the fourteen Earth's-worths of surface occupied by humanity, every conference room has non-stain beige carpets, heavy-but-cheap furniture, and nothing to look at except the screen of your own computer and the sleepy faces of the people across from you. And OSP agents spend at least as much time in conference rooms as they do out in the Thousand Cultures.

Margaret, ever the utter Caledon, walked in and began without preface or greeting. "That note left in Giraut's hand was made of materials which match scraps in our collection of extraterritorial materials. The human DNA traces on it are consistent with the Lost Legion."

It was the most personally embarrassing part of the "extraterritorial

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

problem" for me, so I tried to listen but my mind kept wandering to the annoying way I had become so attractive to those over-romantic idiots.

Until the invention of the springer, the roughly forty-to-sixty light-year limit of human settlement had been enforced by the limits of technology. A single colony ship could travel around that far, taking a century or a little more, before too many of its ninety-six adults in suspended animation died in the tank, leaving too few adult survivors to move into the robot-built city waiting at the other end, and to decant and raise the first generation of "natives" from the ship's bank of a million frozen embryos.

In the centuries following the Inward Turn, technology had been systematically held in place, so that fifty-light-year-or-so limit had become a de facto cornerstone of policy for centuries.

No colony ships had gone farther than the 102 (of 109 attempted) cultures barely planted on Addams, circling Theta Ursae Majoris, and the even more marginal two cultures on Briand, circling Metallah, each just over sixty light-years away. Addams and Briand had been reached by pushing every margin, and only attempted because there was no remaining standard culture space (650,000 square kilometers of reasonably contiguous, walk-around-without-special-equipment land) anywhere closer.

Ninety years after the colonization era began, the last ships left Earth for Addams; 134 stanyears later, when the determined aintellects brought *Susan Constant IV* into orbit around Addams with ten surviving adults and most of its embryos dead, the colonization era ended, apparently for all time.

For the next 450 stanyears, then, until the springer, humanity was confined to an irregular, three-lobed blob of space that would all fit into a hundred-light-year diameter sphere, with Earth somewhat off-center of the intersection of the three lobes. The human bubble was only about twenty parts in a billion of the volume of the galaxy, but we were the masters of our bubble, with no compelling reason or cheap means to go beyond it.

The springer had changed everything. Historians intended no hyperbole in saying it was the biggest innovation since fire or the pointed stick. If there was a springer anywhere you wanted to go, you could cross many light-years in a single step; just the night before I had made a precautionary emergency-room call of fourteen light-years, and Paxa and I had walked from our hotel room, with its view of Epsilon Indi setting, to this conference room in Manila on Earth.

Within human space, you could go anywhere by radioing directions and waiting for the people on the other end to receive the message and build a springer; once they did, everywhere was as close as the next room (assuming you could afford the astonishing amount of energy required).

Beyond human space, you first had to send a springer there on a rocket—but a springship was a radically different rocket from the huge, half-light-speed behemoths, stacked with suspended animation tanks and equipped like hospitals, that had planted the first colonies.

A rocket always gets the most acceleration from the very last drop of fuel in the tank, because the engine pushes with constant force, but the mass of fuel you're pushing decreases as the fuel is expelled. But on a springship, every drop is the very last; you need not even send a reaction chamber, just a nozzle with a springer at the back, through which you spring a jet from as big a stationary chamber as you like.

Send out a robot springship the size of a large desk, boosting at a hundred g because it has no fuel tanks, just springers delivering light-speed pro-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tons from back home right into the nozzle. Do that for one week and you are close enough to lightspeed for every practical purpose. Control it via laserlink through a microspringer; no signal strength problem and no speed-of-light lag, no matter how far it goes. Keep aiming your springship for the next nearest F, G, or K star.

As it passes each star, scan the habitable zone for any Earth-sized world with free O_2 in the atmosphere. If no, on to the next star.

If yes, the springship flips over to ride its jet down into the solar system for a closer look. If things still look good from closer up, descend all the way into orbit around the planet. If it's still good from orbit, descend on a nice cool jet of room-temperature nitrogen, so as not to disturb anything, set the springship down on a reasonably stable, solid patch of dirt, open an exterior microspringer on the springship's surface, and dump a couple of tons of nanos onto the face of the new world. Over a few weeks, the nanos strip materials out of the surrounding land to grow an enclosed habitat suitable for humans, with a full-sized springer inside, and another door opens onto the frontier.

As soon as you have a springable base on an alien world, with enough redundant springer capacity to ensure you won't lose it, the springship takes off again.

Theoretically the Council of Humanity's probes—and *only* theirs—were to catalog every habitable and terraformable planet for fifty light years beyond human space, and a procedure would be established for applying to establish new colonies.

That survey process was now about half complete—except that across roughly a quarter of the northern celestial hemisphere, wherever Council springships had found particularly promising solar systems, when they had descended for a closer look, they had suffered an "abrupt functional stoppage/disconnect"—"AFSD" was a standard abbreviation. It was widely said, in security circles, that AFSD stood for "Actually Fucking Shot Down."

We knew who shot them down. While the Council had dithered for a quarter of a century before the first study-to-do-a-study had been authorized, the nearest and best habitable worlds had been illegally settled.

Launching a springship was so cheap that a largish corporation, political party, foundation, religious congregation, or criminal syndicate could probably launch a few every stanyear. Fuel cost was another matter, if you paid it, but there were a lot of places you could steal about 120 grams of antimatter per stanyear, enough for the civilian power requirements of three to ten cultures, to be sure, but one clandestine VNP could be making three or four kilograms per stanyear and springing it to scores of probes, and VNPs built themselves; all you needed was a clean copy of the nanoware and a corrupted aintellect to tinker it into operation without calling the cops.

So while the Council of Humanity dithered, other parts of humanity had settled in several star systems in the direction of Ursa Major, Leo, and Boötes, well beyond the official surface of settlement. The OSP knew of a political entity called Union, comprised of at least nineteen "extraterritorials"—illegal colonies. We had a few dozen Union-made artifacts captured here and there, some photos and vus, and an ongoing project to infiltrate the smugglers (we had not found any yet, but where there is a border, there are smugglers).

And I was being cautiously approached by the extraterritorial most perfectly suited to embarrassing me: the Lost Legion.

The Lost Legion had begun as an Occitan special unit, like other monoculture special units within the CSPs (the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Thorburger Pioneers, Chaka Zulu Scouts, Égalité Rainbow Rangers, and so on). But the Leghio Occitan had been disbanded after the Utilitopia Massacre during the Council intervention in the Caledon Revolution.

I had been in Utilitopia when it happened, on my very first diplomatic mission. The very building where Occitan troops had killed forty-three civilians, most of them prostrate and screaming for mercy, had been my main base of operations.

Somehow, some of the Occitan Legion had found the resources to establish an extraterritorial colony in Union space. We knew their capital city was Masselha, that they called their culture Noucatharia, and that it was on a planet they had named Aurenga, but not which of many possible suns might be theirs.

"Giraut?"

"Sorry, Margaret, my mind was wandering."

"We could tell. Does anyone have any thoughts?"

"The most interesting thing is that it's so melodramatic," Paxa observed. "As if—"

"Any other thoughts?" Margaret asked, cutting Paxa off.

"You just got one," I said, "Possibly a good one."

Margaret glared at me. "If you had been listening, you would know this is the fourth time that Paxa has brought this up, and while we all agree with her, none of us, including Paxa, has been able to make any progress beyond the observation. And I think that if Paxa had actually had anything new to say, she would have begun with it."

Very long silence. Finally Paxa said, "Will you two please let it go? Giraut, she's right, I was repeating myself. Margaret, that was still rude."

"Was it? I'm sorry." Margaret has a knack for apologies that drip poison. "Till we know what it's about, everything depends on where and when they contact Giraut. Does anyone here propose changing the basic plan?"

No one did.

"Then Giraut will go forward with recording sessions for the new material in Noupeitau, and the rest of you will hang around on the expense accounts until something happens. Paxa, would you like additional resources or changes of procedure?"

"Surely she can just send a memo," I said, before Paxa walked into whatever trap Margaret was setting. I kept my tone cold. "As long as we all agree that I ought to stay alive, I think we can trust everyone's competence."

Margaret was very quiet for the space, perhaps, of three breaths.

"Does everyone know about the DNA workups?" Laprada asked, brightly, as if she were suggesting charades at a dull party.

Margaret started as if Laprada had suddenly begun to eat imaginary bugs. Laprada chattered on happily. "I'm sure not everyone has heard. We got the detailed lab work back. DNA of the two corpses is a clear match for three Occitan families known to have members in Noucatharia. They were young, like always—about ages sixteen and fourteen—and riddled with carcinomas."

Raimbaut leaped in. "Actually, if you were profiling whoever is trying to kill Giraut, it's teenagers with Occitan ancestry, whole-body cancer, and brain-bombs."

Dad said, "Of course it's easy to overlook something unsurprising; they're exactly like all their predecessors."

Margaret folded her hands and sat back, in a gesture that reminded me very much of Shan. "Excellent. You were right, we did need to cover that. Any other information we should have covered and haven't? Good. Giraut, Paxa, we have one more thing. The rest of you can go."

When the door had closed behind them, she said, "Giraut, the Board of the OSP spent its morning meeting dis-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

cussing the third set of your concert. Do you even realize why?"

"Well, of course I know *why*. I'm one of very few actual witnesses to the teachings of Ix, so the Ix Cycle *cansos* will become an Ixist sacred text. Some idiots will take it that I've gone Ixist, or even that the OSP has. Plus I welded the traditions of genocided peoples onto the traditions of genocidal peoples, something we discourage, according to guidelines I wrote. Does that cover it?"

"That does," Margaret said. "Now, for the love of God, why? *Donz de mon cor*, if it were just me, I'd shrug, and say make and sing whatever songs you like. But the Board has to come up with a policy about your performing and recording the Ix Cycle. I would like that policy to be 'leave Giraut alone.' I need to be able to say that you told me something that will cause that to be the policy."

It was such a good act, I felt like applauding.

She was hiding behind the rest of the Board. They didn't have a tenth of Margaret's knowledge of artistic matters, so they might grumble and ask a lot of questions, but they would do what she told them.

"Well," Paxa said, very tentatively, "of course you're making the usual arguments about an artist only being effective if he appears to have his independence, and that sort of thing?""

Margaret made a face. "I'm stalling with all the standard tricks. Sooner or later I'll need a real answer."

After some time, Paxa prompted, "Giraut?"

"Still thinking," I said. "I guess the songs needed to get out into public discourse—"

"Oh, they're that, all right," Margaret said. "*Plenty* of news coverage. Your fastest takeoff ever; pre-orders are *rocketing*." She sighed. "Giraut, I need a reason that people who don't give a dry turd about music will understand."

A pause.

Paxa coughed and said, "Giraut, you know the two of us don't usually agree about much of anything. But we're agreeing now."

"Well," I said, and began again, "Well." What I wanted to say was *"Well, I don't feel the need to answer further,"* but clearly that would not be the right answer. "Well," I said finally. "You know those conversations we've always had over wine, about how the OSP is always somewhere in the middle about diversity and unity? You and I used to have them, Margaret, and now Paxa and I have them, oh, and Raimbaut and Laprada and Dad too, you know, I think we all do. If humanity is too unified we'll stagnate but if we're too diverse we'll fight and how the OSP is always promoting diversity where people want to just relax in to sameness, and pulling things back to the center—"

"Chapter Two of the basic training manual," Margaret pointed out. "Which you wrote much of, from Dji and Qrala's notes. So you're doing something to add diversity, is that what you're trying to say?"

"Margaret, sometimes when you cut to the chase, you miss the whole movie," I said. "Diversity within boundaries isn't really diversity, it's unity. Even if not very often, diversity has to violate boundaries. Someone needed to violate some of those boundaries. And I did it in a work centering on Ix, who might just be the most unifying figure we've got available this century, so . . . I promoted unity by violating the boundaries that control diversity . . . that's . . . that's . . . it adds up to . . ."

"Incomprehensibility?" Paxa suggested.

"I think I see what he's getting at," Margaret said, "and that worries me."

"You ask me for an answer, which I'm not ready to give, and then you make fun of it."

"We'll shut up," Paxa said.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Margaret nodded.

"Oh, freedom and differentness and stimulation. Everything that makes the real world wild and the virtual world tame, no matter how dull the real gets or how much running and shooting and screwing there is in the virtual. Energy you get from difference, all of that. If a free society or real art finds a line it can't cross, sooner or later it has to try. Or else all the diversity is just a fake.

"Now, Ix and his religion are expanding into the Thousand Cultures like yeast in bread dough, shaking up all the places that were still reeling from Connect a generation or more ago. But also pulling all of us together.

"And transgressing rules like not combining music from some traditions kicks things over. Spills them out and creates more wild differences. Keeps us out of the box. And gets Ix's message of peace between people out to more people because it's lively and interesting and even people who don't agree will have to react to the art. And all sorts of good things.

"It was just *time* for this. Sometimes the cure for hardening lines of conflict is more freedom of thought, I think, if everyone is saying 'It's either yes or no' someone has to say 'Why can't it be green?'"

"Diversity begins in your own skull," Paxa said quietly.

"Right," I said. "I agree, whatever that means."

"The Board meets again in three standays," Margaret said. "Giraut, I believe you did something you think is important and good and right. I even sort of understood some of your reasons. Now all we need is a way to make the Ix Cycle look all right to the Board. If I have that, I'll carry the argument in there and shout it into their teeth and make them listen and *like* it, but you have to help me. Can you come up with a simple, articulate version of those thoughts?"

"If I could, I would have."

Paxa raised her eyebrow, and one finger. "Only if you could have *already*. Maybe tomorrow you'll be able to?"

"I'll do my best." That would get me a few days' reprieve.

Margaret's satisfied look was a compliment I'd rather not have received. "You always do, Giraut. When do you start recording?"

"First rehearsal tomorrow morning."

"Enjoy the trip—love to your mother—Paxa, I don't envy you putting up with him while he's recording."

"I don't envy me either," Paxa said.

"I just like to get things *right*."

"Exactly." They said it in unison, and, despite themselves, shared a laugh.

"Well," I said, an hour later, back at our temporary apartment on Roosevelt, "Margaret was exceptionally strange and unpleasant today."

Paxa exhaled through her nose, her jaw clamped. "I wish I understood what she's so angry at me about. You and I didn't get involved till years afterward."

"She's not jealous because you're with me, she's jealous because she thinks I'd rather have been with you all along. Jealousy isn't rational."

"I'll say." Paxa's Hedon heart would always feel that jealousy was not as serious a failing as pedophilia, but definitely worse than compulsive nose-picking. "You have that soft, patient look in your eyes," she said. "Just give me a backrub."

"Stretch out on the bed then." I worked the knots on her back; she warmed and relaxed under my hands.

After a time, she said, "Now hold me," and I lay down and she snuggled under my arm.

"Good job," she said.

"Good job at what?"

"Something that doesn't come naturally to you. Just consoling and being there. I know that you want to be my big strong Occitan man and leap up onto your white charger and rescue the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

princess and slay the dragon with your mighty penis."

"Ouch."

"I didn't mean to sound harsh—"

"Just the image. Dragons are supposed to breathe fire."

We lay there and watched the household robots work, until they ran out of things we trusted them to do by themselves.

Our newest robot, the chamberlain, rolled into the springer, its upper bar hung with all my shirts.

Seconds later, it rolled back through the gray mist of the springer, from the house we were renting in Noupeitau, forty-six light years away, into the closet, and emerged with most of my pants. It had the previous four chamberlains' memories, but I was still training it in applying them. "Chamberlain, clean, press, hang; dupe anything with holes, faded dyes, or frayed seams."

"As you wish, sir," the robot said.

"Why do you do that?" Paxa asked.

"Do what?"

"Order all your robots to say things like 'yes sir' and 'as you wish' and so forth. Giraut, do you *enjoy* making the machines obey you?"

I shrugged. "They're robots. They do whatever I tell them."

"Would you enjoy it more if they were people?"

"People have feelings!"

"So do robots."

"To function around people. They're robots."

"Robot, are you equipped with pain and fear modules?"

"Yes, ma'am," it said.

"This is silly," I said. "Of course it has pain and fear. How could we train it if it didn't? Robot, do you have pride or dignity?"

"Currently I do not have those modules, sir. They are not recommended for a robot with my duties, sir, but if you wish I can order them, sir."

Paxa stuck her tongue out at me, so I suppose the argument was still friendly. "No, you're fine as you are," she said to the robot. "We are very pleased with you. Do you have a module to feel pleasure when I tell you that?"

"Yes, ma'am," it said.

"Then we are very pleased with you. You may return to your regular duties."

"Thank you, ma'am." It rolled through the springer, back to our rented house in Noupeitau.

"Now what was all that about?" I asked.

"I'm just appalled that a man I love can treat a thinking, feeling being the way you do. I wonder if maybe you'll treat me like that some time."

"It's a rolling armoire, Paxa, it just feels and thinks for our convenience. It has fear so that if the house is on fire it will flee outside and not waste the money *we* spent on it, loyalty so it will grab as much of *our* stuff as it can, pain so it won't take it through the fire. Pleasure so if *we* like something it does for us, it will remember to do it *for us* next time. It has the feelings *we* need it to have. That's nothing like relations to another human being. The robot is just a complex of things it knows how to do, experiences it remembers, and a sense of when to do them."

"And what is a human being in a psypyx?" she asked.

"A human being. The OSP expended a lot of blood and money to establish that."

"But a psypyx is just a piece of black plastic the size of a thimble. And it doesn't even talk or move the way the robots do, or think and dream like the aintellects—"

"Paxa, what is this about?" I didn't want to become angry. She might be picking a fight, but she did that very rarely.

"Remember that time you got frustrated with the chamberlain that couldn't get right how you like your shoes shined? Three before this one, remember?"

I shrugged. "I had a tantrum, I'll ad-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

mit."

"You ordered it to upload and store its memory, and you made it order a replacement for itself, and then instead of selling it used—"

"It's not nice to sell a defective robot—"

"You sent it into the regenner to be disassembled and recycled into raw materials. You didn't even turn it off first."

"Paxa, I am not going to do that to a human being. And it isn't the same thing anyway. And I don't know what's going on. Did you become a robots'-rightser overnight?"

"No." She looked down at her feet. "I want to tell you something important, something I think is wonderful, and I'm afraid to say it, so I'm thinking about everything about you that has ever bothered me, and the way you're callous toward robots matters more, now."

"Now *what?* What's changed?"

"Don't be angry."

I took a deep breath and said, "Paxa, I can't promise not to react, but if I lose my temper I'll go in the next room and kick the furniture—the non-sentient furniture. Okay?"

"Okay." She sighed. "There's just this thing I never told you." She sat on the bed, holding herself in her wrapped arms, looking at her feet. "For a long time after Piranesi was killed, with no psypyx left behind—for me, it was the end of the world. That's why I didn't accept the accelerated grief treatments, and mourned him for more than two stanyears. I think I was expecting to pine away and die; I thought just before I did I'd have my psypyx wiped too, go off to the void with Piranesi. You know how much I care for you, but you also know . . ."

"That I will never be Piranesi Alcott." I said it quietly, I think without bitterness. It was just true. Part, maybe most, of Paxa's heart was buried beside him, overlooking the Western Ocean from a hilltop in Hedonia.

"Yes, thank you for saying it. So for all these stanyears that you and I have been together—while I recovered with you as my friend, while we became lovers and partners and then a comfortable old couple—this is the hard part to tell you—every time the OSP requires me to get psypyx recordings, I have been wiping them as soon as they were made."

She looked for a reaction; I must have looked blank. She shrugged. "I just punch the erase as soon as I wake up. Never even gave them time to do a brain-body type on me. I don't even know what my type is.

"I was doing that so my affair with you will be gone from my memory whenever I finally die and come back."

At least this was a piece small enough to understand. "Someone would tell you, or you'd read about it in a document—"

"Oh, I'd know about it, of course, but I wouldn't *feel* it. When I came back I wanted to be as if I had just left Piranesi that morning. And if that recording I made a few days before his death was the oldest recording of me, that's who I'd be. I had special instructions in my will not to use any newer copy if one got made or saved by mistake. You see? That's what I chose to do, every three weeks when the OSP made us record a psypyx again. That was my choice."

"It's always been your choice, Paxa. I thought at first you were having an affair with me to recover before finding someone else to be serious about. Eventually I realized you didn't want to be serious about anyone, ever, again, and that was why you stayed."

"It was. It's different, now." She clutched herself more tightly than before. "Giraut, I don't want to lose our times together. I'm going to have a current psypyx made, and keep it, and change my will."

"I'm honored," I said. I was, and I didn't know what else to say. Part of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

me wondered, what if she had died on a mission before now? I would only have found out when they went to revive her. But what I didn't know hadn't hurt me then, and now it never would. Rather than try to say more, I just kissed her.

Some time later, I said, "So what did this have to do with 'robot abuse'?" (I said the phrase as a joke but she seemed not to notice it).

"There are things that are acceptable in a friend-and-lover that I'm not sure about in a life-companion," she said. "These last few weeks I've been looking at everything about you. I've noticed the way you stand up to Margaret for me, every time, even though you're still in love with her. I've noticed that even though you sometimes behave very badly, you do apologize and try to make amends and rarely try to defend it. And so on. Watching and thinking. And then I was just about to tell you, and you were harsh to that robot—did you know it's very, very afraid of you? It knows what you did, once, to another chamberlain. Do you read their emotion logs at all?"

"Never," I admitted. "If I did, I doubt that I would care."

"Well, and so . . . Giraut, cruelty to machines isn't something that makes me say never, never, never, but it is still cruelty, and it did stop me, just then. And I had to remind myself to go through with it. Can you try to be kinder?"

"I can try. I've done harder things for you many times, gladly. And really, I would never treat you or any other real person like that. Really."

"I know you believe that."

I kissed her again, afraid of more discussion. I wasn't entirely sure I would pass whatever test this was.

We had found a window that matched Trois-Orléans local solar time to Noupeitau local solar time closely enough to avoid spring lag, though it would still feel a little odd, crossing over at noon, to have had fourteen hours from midnight to noon, and then have less than ten hours from noon to midnight. The robots finished in plenty of time and went off to take care of unpacking and laying our things out where they belonged.

We took a last glance around to make sure everything was in place, then stepped through the springer in one wall of the hotel room, forty-six light years in one single step onto a crowded, busy street between the spires and arches of Noupeitau.

Paxa coughed with mild springer sickness, the daylight went from golden straw to medium amber, and the slight increase in gravity felt as if we were on an elevator that had started with a lurch.

"Bull's-eye noon," I said.

Arcturus, dead overhead, was a tiny dot, barely more than an extraordinarily brilliant star, surrounded by a tight circle of gold, a broader ring of blue, and a most-of-the sky circle of mauve, and the horizon was rimmed in crimson. Bull's-eye noons usually happen the day after a big thunderstorm clears the air of Wilson's endemic natural pollution. "It's going to be a really nice afternoon." I took Paxa's hand.

Wilson was almost exactly between Darks, the every-six-stanyear continental fires that dimmed the skies of my homeworld. The fine black soot never fully cleared from the atmosphere, so that Arcturus's already ruddy light was exaggerated into almost blood-red at dawn and dusk, but today the veil of fine carbon particles in the atmosphere was much thinner than usual. Colors became garish. Increased visual acuity revealed the shadowing on buildings as carbon smears. Robots were scrubbing the sidewalks.

"How often do people here need treatment for lung cancer," Paxa asked, "with all the horrible stuff you breathe?"

I shrugged. "All of us have a few

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

spare lungs grown and waiting in cryo. My mother has had two replacements so far, and Dad had one before he moved into his clone body. How much skin work does a Hedon need?"

She laughed. "Fair enough." Hedonia was a culture of pale-skinned nudists on an equatorial desert coast. "Still, I'd rather need a skin graft than a lung replacement."

We descended a wide staircase into Palace Square, where, at tables under dozens of thick-boled oaks, Noupeitauans came to sit, eat, drink, argue, do nothing, and watch people.

The *jovent* costumes of my youth (flowing *tapi*, clinging tunic, billowing breeches, and elegant boots) were long gone, and so were the full dresses and skirts (and, alas for my tastes, the plunging necklines and waist-length hair) of the *donzelhas*. Still, Occitan men wore their fashionable jackets, tunics, and slim straight-leg trousers tucked into lower, square-cut boots in a way that recalled the bravoes of the past, and the fuller pants and occasional slim skirts on women had a grace and a certain *nonsaique* that still marked them as Occitan.

"You're having thoughts," Paxa said.

"I often do. But, yes, I'm a little sad. Thinking . . . if you had died in one of the fights a couple of nights ago, I would have just found out you had kept your psypyx out of date, and that you wouldn't be coming back with our shared memories. And this square would be the loneliest place in human space."

"Oh." Paxa shrugged. "But we're here. And human space is covered with good places to be, and this is one of them. And tomorrow I will go in and get my psypyx made and not wipe it. Even find out what my type is; do you think, if she's compatible, Laprada would agree to wear me while they grow my clone body?"

"I don't know, *midons*, but I've just managed to make my morbidness contagious—now *you're* talking about dying."

"You're right," she said, and made a face at me as if I had done it on purpose. "With all this safety and love and laughter around you, why are you mentally living in some universe where you're crying?"

"An unfortunate tendency in artists, I admit." We took a table and commed an order to a café we could see across the square, for a light, spicy seafood soup and orange-slice-and-spinach salad to split, with a large carafe of Caledon apple wine.

The café's aintellect said, "The robot will arrive with your food and wine within an estimated fifteen minutes, *Donz* Leones. Are there children at the table, donz?"

"No need for any balloons, but there *are* sentimental people here. Is the red harlequin available today?"

"He should be, donz, and I will try to get him for you. Welcome back to Noupeitau, *Donz* Leones. We are always glad to see you again."

"Thank you."

My very first time in Noupeitau, with Dad and Mother when I was six, we had gotten steamed-sausage-with-peppers, fried dumplings, and ice cream, brought to our tables by the red harlequin robot, who was at least a hundred stanyears old even then. I had requested that same robot the first time I had brought Margaret here, shortly before we were married.

The stanyears had wheeled around, the marriage and much of my hair had gone, and the red harlequin (by then a springer-carrier rather than a food-carrier) had delivered a round of drinks to celebrate Raimbaut's getting a new body—and my being able to drink again, now that his psypyx was off me. I remembered that warm red twilit evening: Raimbaut, blissfully drinking his Hedon Gore in his brand-new four-year-old body, feet dangling from his adult-sized chair; Rebop, my dear

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Earth friend, grimly drinking seltzer water because she was still wearing Laprada's psypyx; and Paxa, laughing and smiling almost for the first time after Piranesi's death. "Remember the first time we were here together?"

"Oh, yes. Now Raimbaut and Laprada are in their own bodies (and into each other's)," Paxa said. "And poor Rebop—she wasn't really cut out for the physical life, was she?"

I sighed. "I hate to think of her having gone into the box." Physically she stayed eternally in her once-charming apartment, now stale and dusty, on the beach of one of the Floridas. Psychically Rebop lived in a virtual Regency Bath, pursued by handsome young beaux; her last few letters had been about nothing but intrigues and romances in Bath, circa 1815. "Remember how she laughed when she first saw the red harlequin? She only went into the box after the evening that Caravaggio goon tried to shoot us."

"She wasn't hit."

"It was scary to a civilian. And she didn't like seeing me break his neck. Rebop really did try, Paxa, that's all I'm saying."

"I didn't mean to criticize your friend."

"I know, I know, I'm sorry. I'm very edgy. She'd be out here with us, still, if the outside world were a better place."

"And yet we love it. Giraut, let me ask you this—we're nearly immortal, we just keep living from physical age four to physical age whatever, over and over. Are we completely insane that we want to do that in a world that really is so violent and where things get broken so badly? Did Rebop maybe have the right idea, just move to someplace where you can enjoy life till you die?"

"There's no variety where she is."

"There could be at one request from her to her aintellects; she could wake up in a new world every morning forever if she wanted to. Maybe she's sane and we're crazy."

"Morbidness is definitely contagious," I said. "You and I *like* that the world around us wasn't made for us and isn't there to please us. "

The red harlequin robot's obscene grin, eye-dazzling diamond pattern, and ancient line of patter were exactly the same as always when it rolled up, opened the springer on its chest, and set out our food and the sweating pitcher of wine. We said nothing for a while, busy enjoying the thin, fiercely-peppered soup, picking at the chilled fruits and vegetables, and drinking the icy Caledon wine.

Something moved in the corner of my vision.

I rolled low out of my chair and came to my feet crouched and with all senses forward toward—

—a robot delivering food, sightless inane sweet smile on a bobbing head, a big bunch of silver balloons tied to one of its long bunny ears. Boy about seven, girl about five, older man (grandfather?) at the table.

As I watched, it presented a balloon to each child. They insisted that the older man take a balloon too. Grinning, he tied it onto his jacket's pocket flap.

"Put that away, Giraut," Paxa said, and I looked down to see that my maser was in my hand, safety already clicked off, though at least I still had it pointed up at the sky. Decades of training ensured I succumbed only to *safe* madness.

"*Deu*," I said. I set the safety, reholstered, took a deep breath, looked around again.

Perfectly safe tables and people under the oaks in Palace Square.

I felt my quads and hamstrings tightening, and boing-marched back to my chair in an awkward, puppet-jerked-on-a-string way. When only half your muscles are flexing, and the rest are locked, the whole world fights you.

Paxa poured me the rest of the wine and ordered more; she slid her chair around behind me. Hedons rub the hu-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

man body the way Occitans sing, Thorburgers fight, or Trois-Orléanians cook—automatically, easily, the most natural thing in the world. "Deep breaths, deep breaths. We've done this before, Giraut. The thing that amazes me the most," Paxa said, digging hard with her thumbs into the hinge muscles just above my tailbone, "is that it always takes you by surprise."

"It surprises you too."

"I meant generic, any-old-body you, Giraut. No particular slur on you. Or me, for that matter. You were a target twice within five hours. *Not* low-stress, *non be*? This is how you react to stress after the stress is over. I've seen this before. I know what to do." She paused in her rubbing to stand up and hug me around my chest, her hands squeezing my pectoral muscles, chin digging into my shoulder muscles. "If I minded doing this I'd long ago have left. Now get nice and drunk and let me rub your back."

It was still a beautiful day, and after all, I was home, immersed in the blessed balm of a thousand small pleasures: the way one couple walked together. An old melody from a street musician far away. Sooty-red sunlight on the golden West Dome of the Palace. The crisp-and-sweet taste of the Caledon wine, so reminiscent of the sugary apples of that cold planet Nansen. Paxa's hands.

At half past fifteen o'clock, I swallowed the scrubber. "There's time to walk, *midons*, instead of spring."

"Would it please you?"

"Time with you always does."

"Any Occitan male always talks like that, I know, but I like the way you always mean it."

We climbed the steps out of Palace Square. Just at the top, the daylight around us went out as if someone had thrown a switch. Wilson turns fast, and Arcturus is just a dot in its sky, so the direct light cuts off like that. Hazy red stars burst in a spatter across the sky between the towers in front of us.

"Usually in the past," Paxa said, "When we've come here, you've gotten together with your mother in the first hour."

I didn't answer, trying to think of what to say.

After a few more steps, Paxa asked, "Is it anything awful?"

"It involves love. Of course it's awful." I put an arm around her, resting my hand lightly on her shoulder. "Lately Mother's letters contain no gossip about friends, no news of Noupeitau, and although she's publishing papers as fast as ever, nothing about her work. Lately she writes about just one subject: how much she misses Dad."

"Oh, no." Paxa looked slightly sick.

"She went so far as to be retested."

"I take it she's still UT?"

"They never make mistakes like that, especially not twice. She's UT. She's going to grow old and die, and it could be a decade, or a century, or never, before they have a way to get her off a psypyx. He's physically eight and he'll be able to recopy forever."

"Oh, Giraut, that's terrible."

"They decided to divorce and not write, but deciding is one thing and accepting is another."

Mother had a fine mind and a healthy brain, but they were the wrong type—actually UT wasn't a type, the U was not a Chandreseki Protocol Group and the T was not a Ramirez Microstructural Number. UT stood for Untransferrable—untransferrable because no mind-body type worked with yours, and the necessary process of growing Chandreseki bonds to a host mind, before you could rebond to your own cloned body, was impossible. It was like "being a flathead screw in a Phillips world," as the macabre joke went—everything was the same except nothing would fit your head.

If you plugged a UT mind, like Mother's, into a host brain, they adapted normally at first but within a couple of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

weeks were unable to contact their own geeblok and emblok, thus unable to have emotions or short-term memories of their own. Such isolated minds shortly vanished into raving, terrified solipsism.

When Dad had died, Mother had thought she would psypyx transfer to a new body so that she and my father could emerge at about the same physical age. The first exam was when she found out she was UT.

They would keep making psypyxes until her mind began to go, but until the UT problem was solved, she was stuck, first in her body, then in inert storage.

Paxa asked, "Does it ever bother you that no one human has ever checked Chandreseki's work, or Ramirez's?"

"They're aintellects, Paxa, no human being can check their work; nobody can hold that much information in the mind all at once. And actually, I'm glad that they are aintellects."

"Really? But you have such a horror of aintellects." She reached up to rest a finger lightly on my mouth, her hand moving as delicately and precisely as it did with a knife or garrote. "Yes, your culture never tolerated humaniformed robots and hid its aintellects as much as possible. And after the things that happened during the attempted coup, you have more reason to hate and fear them. But, you know, the same things happened to me, and I lost Piranesi, permanently. All right, so you irrationally loathe any mind that doesn't run in meat. Now, *why* are you glad that psypyx technology, on which we all depend, is completely developed and controlled by millions of copies of Chandreseki Corporation Aintellect Number Eighty-Four and Ramirez University Laboratories Aintellect Pi Gamma Sixteen?"

"Mother doesn't just get care from doctors who studied with Chandreseki and Ramirez, she gets it from Chandreseki and Ramirez, who have worked in every clinic in every city in human space, accumulating millions of stanyears of experience every stanyear, because within six hours, what one copy knows they all know. I also want aintellects and robots to fly any spaceship I ride on, and I prefer that if there's a dirty, dangerous job to be done, a robot go there to do it. I like everything human and physical, except when it's uncomfortable or inconvenient."

"After all these years, I'm finally turning you into a Hedon." She pulled my face down to hers. We kissed for a long time there in the street. I wish I could say I was lost in the wordless wonder of it all, but actually I was thinking that someone could have taken a marvelous monochrome flat photo of us backlit by streetlights, perhaps for the cover of a career retrospective recording.

Mother had chosen to move into an apartment in Noupeitau. She said she had had about all the quiet country nights she could stand, on the outskirts of Elinorien, the small town up the coast where I had grown up. She had kept enough mementos to fill two large cases in the front entryway, and enough photos and vus to cover the walls everywhere else, a small fraction of what had been around when I was growing up.

My mother was one of the most distinguished scholars on the Archived Cultures, her reputation well-established in the nearer star systems (which had had time to hear of her early work, via radio) even before the springers opened the doors to rapid exchange. In certain academic circles, I would always be "Aletzanda Leones's son—didn't he have some sort of career, too?"

The Archived Cultures had once been the epitome of useless study for study's sake. During the last desperate years of the colonization era, the ethnic groups that had not yet bought an extrasolar space were ordered to record,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

then assimilate. They had protested, but no one was of a mind to listen. 1,228 cultures already sown among the stars was enough diversity for the human race; no one wanted to risk another Slaughter, that fourth and final world war whose memory was burned and melted into the human mental fabric as surely as the black glass that covered Central America, Honshu, Europe, eastern North America, and hundreds of smaller areas.

The accepted explanation for how such an atrocity had happened was that finally humans had just been too different from each other; if there was going to be difference, let it be in the stars, and not on Earth. The legacy of that decision was the scattering of the Thousand Cultures onto twenty-six planets (eleven of which now had ongoing violent ethnic conflict, and Briand had died of it), and the archiving of over three hundred ethnic groups.

The study of those archives had been discouraged on Earth, but out in the Thousand Cultures it had eventually flourished. Now it was becoming vital, for the decision had been made that the first few colonized worlds would hold the revived Archived Cultures, and Mother had gone from prominence in an obscure field to an important consulting role to the Council of Humanity.

Wherever you looked in Mother's apartment, endless photos and vus showed her standing next to other scholars, accepting medals, cups, and various other objects of congratulation.

I stroked the solid brass assegai that she had gotten at Chaka Home, above which Mother displayed a vu that showed her frantically trying to hang onto that heavy, slippery object after it was handed to her. She wrestled it to the ground and sprang back up, inadvertently handing it back to the tall, elderly presenter, dressed in the traditional fatigues and beret of Chaka Home, who recoiled and handed it back to her, so that she almost dropped it a second time.

"Isn't that about half a minute before—" Paxa began.

"Oh, less than that," I said. "Probably five seconds?"

"Before what?" Mother said, bringing out a tray of canapés.

"Before the vu that Giraut keeps on *our* wall."

Mother shrugged. "The pleasures of parenthood. You go from the person who does everything perfectly to painfully embarrassing, and eventually your child thinks your most embarrassing moments are the really endearing ones."

"It's lovely that Occitans are so attached to your parents," Paxa said. "I was crèche-raised, barely knew my mother, and couldn't pick my father out of a police lineup, though I understand that might be the right place to look for him."

We went out on Mother's balcony, up above light-level, to look at the sky. "Geometry is a wonderful thing," Mother said. "Take a sphere, and surround it with another sphere that's twice the radius of the inner one. The outer sphere will have eight times the volume of the inner. So whenever you double the size of a sphere, you get seven more spheres worth of space. The exploration springships have reached hundreds of terraformable planets, which means tens of thousands of colony spaces. *And* it's easier to get there.

"There are going to be Miskitos and Samoans, Ainu and !Kung, again. Not that they'll be the culture that was recorded, but there will be *something* of them. And even though the Office of Human Expansion knows my condition, they don't care, they want my advice." Her eyes sparkled. "Of course they would be getting it whether they liked it or not.

"This hasn't made it to the news yet. We discovered that nine Baluchis infiltrated the first big beta test group for the very first psypyxes. We have actual

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

recoverable psypyx recordings of them! Real Baluchis for when we set about growing New Baluchistan!"

"But I thought the psypyx wasn't invented until long after the Great Assimilation," Paxa said.

"Oh, it's a great story. At the time of the Great Assimilation these Baluchis were all boys, none over the age of twelve. They were supposed to be scattered for re-education, but bureaucrats messed up, as bureaucrats will, for good or ill, and they were all sent to the same boarding school in Methane City, on Titan. They were clever enough to hide their connection. They stayed in touch, grew up, and covertly tracked down Baluchi women to marry. They contrived to stay near each other for almost eighty stanyears, and no one knew. They were all still alive to volunteer as test subjects for the first psypyx project, probably hoping to get new bodies to continue to hide in.

"That's what seven very clever aintellects and I have unraveled. And sure enough, all the psypyxes are still there in storage, four hundred sixty stanyears later! Now all we have to do is find the right volunteer hosts, and we can talk to someone from a pre-Assimilation culture—nine someones from the same pre-Assimilation culture—can you imagine? We even have their DNA! We can download them onto new bodies and send them off to start New Baluchistan. It's the biggest discovery since they found those three Mixtec children still alive in suspended animation in Luna City, almost a hundred stanyears ago. *Gratz'deu* I'm healthy and I'll get to see the project begin." She rose. "This city gets damp and chill at night, at least for bones this old. Shall we have a little fire before you go?"

For me, Mother's fireplace always merged that tiny, crowded apartment into campfires long ago. My family had camped and packed often, and I had always been encouraged to bring friends. Almost, I could feel Bieris and Aimeric beside me round the fire, sitting as quietly as Mother and Dad and I. Almost, I felt the urge to throttle Marcabru, who was never good at being quiet and just sitting and enjoying. I was feeling so nostalgic I almost wished Marcabru were there to not throttle (or maybe to throttle just this once).

"Fifty stanyears," Mother said. "More than four of our Wilson-years. I'm glad I've known you that long."

We sat by the fire silently for a long time, just enjoying being together. As the fire burned low and we poured the last of the wine, Mother said, "In a way, being UT fits with my sense of irony. All my life has been dedicated to interpreting difficult, ancient records, and whenever I finally die, I'm going to be a difficult, ancient record myself. I have faith that someone will find it interesting enough to retrieve me. If not, I leave my chemicals to the environment, my ideas to the noosphere, and my genes to the species."

"Your ideas are going to live a very long time," Paxa said. "I heard the name Leones at university, a decade before I associated it with a balding satyr's beautiful voice." She patted my leg and leaned on my shoulder. "You did all right with where you put your genes, too."

"Ooh," Mother said, laughing, "I've just gotten the biggest opportunity in history to ask my son when I'm going to have grandchildren, and didn't. I hope there's room on some wall for a Perfect Mother Award."

Walking home, Paxa and I held hands and said nothing for a long while. "She didn't mention Dad at all," I said. "I had a letter from her just the day before the concert and she was still obsessed with Dad then. But it wasn't like she was avoiding the topic, either. So something is up, and Mother isn't telling me what." Another thought came to mind, and I held Paxa's hand just a little more firmly, and spoke very softly. "Paxa, ei-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ther of us might be killed any time. How do *you* feel about getting a new body?"

"Morbid, my darling."

"You feel—"

"Your question was morbid."

"I'm sorry, *midons*." I said. "I was noticing how graceful you are with your present body, and thinking how unhappy you'll be inside some grotesque obese creature like poor Dji is—"

Dji had been killed by a secret terrorist organization from his home culture of Pure, just last year, and while the medics grew a new body for him and brought it up to four years old, he was busy building the Chandreseki synthetic bonds he would need to run it. The trouble was, he was building them "in the head of a forty-year-old virgin who never went past her front door since she left school at ten, and whose hobbies include eating, masturbating, and masturbating while eating, all while plugged into VR," as the very unhappy Dji had put it, writing to us while his host was asleep.

Dji had been a section chief for the OSP since about the time Shan had been. Nowadays he lived for the moments when his host fell asleep, so that he could write to his friends, or jog her body up and down the stairs (which she allowed provided that he took a shower when he was done, and had her clean and dry before it was time for her to be awake and eating again).

"*Midons*," I said, "The idea of ending up like Dji makes me so nervous that I am hardly willing to be killed at all."

She swung my hand playfully, letting her steps turn almost into skips. "Oh, but Giraut, just imagine hitting puberty again!"

"Can we wait to discuss such terrifying ideas till we're in bright light?"

"Everyone says that, and I'm sure it's no fun to have your body going chemically berserk and your mind being dragged along on waves of hormones," she said, "but you know, going through puberty a second time, with an adult mind in the body, knowing that this isn't going to go on forever, with your trust fund intact, adult patience, an adult grasp of consequences—I plan to go from eleven to nineteen, all my growth years, working out like crazy, getting my muscles, CV system, fine motor control and all into the sweetest perfect tune—and *not* fretting about how late my breasts grow in, or the pimples on my forehead. Because I'll know I'm going to come out of the process extremely good-looking." She did a little lindy-turn under my arm and struck a pose beneath a streetlight. "That was ironic posturing, you know, pretending to be extremely conceited."

"I know." I took her other hand, and we stood face to face. "And you are. Extremely."

"Good-looking or conceited?"

"Yes."

She tickled me, so I had to try to tickle back, but she broke and ran. When I finally caught her belt after two blocks of mad pursuit, she said "Truce!"

"Typical diplomat. *Now* she wants a truce."

"Did you skip that part in training, Giraut, or were you just a little slow?"

I kissed her, long and slowly and tenderly. "All right," I said, "I'm sorry I got so serious."

She pressed her face to my chest. "No, don't be. Can we be serious for just a second? Did you ever worry about the fact that some forms of UT are hereditary?"

I shrugged. "I didn't know Mother was UT till after I was typed so I could wear Raimbaut's psypyx, the second time. So I already knew I was G-8."

She sighed. "Tomorrow while you're recording, I'll be recorded. My first new psypyx since they developed typing. And I'm going to pay extra and get typed, too. I know it's expensive, I know they can do it just as well after I'm dead, I know it doesn't make any

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

difference while I'm alive, but I want to settle the question."

"As you wish, *midons*."

"I love the way you say *midons*. I love being called that."

She took my hand again. We stood just where the street began a steep dive to the front door of our rented house by the waterfront. No words, just her hand in mine. A few diamond stars shone in their ruby settings, out over Totzmare, and the waves out beyond the black rooftops glinted like dark blood.

At the steps to the house, I said, "You know, he doesn't say anything about it, but I think Dad is just as sad as Mother is about her being UT. They had agreed decades before he died that the survivor would record-and-restart so they'd stay the same age."

"That's a lot of love, to decide to try to share *another* lifetime."

"It probably warped me permanently that my parents were the two most in-love people I have ever known."

"I'm getting tested tomorrow," she said. "Not just recorded. Tested too. For sure."

"All right."

Her grip on my hand tightened. "Giraut?"

"*Midons*?"

"One of my sisters, and my mother, are UT. I'm really scared."

In my earlier days I had not been a morning person. Something about the artistic temperament, whether it is a preference for the sort of drama that looks best in chiaroscuro, a fear of excess sanity and stability from too much sleep, or a passion to be unemployable in any regular job, drives the developing artist away from the morning and into the night. But later in life, like many artists, I came to love mornings when the poseurs and mere bohemians are still passed out, the light is clearer, the brain is empty of slights and errands, hormones are as in balance as they will ever be, and everybody—most of all one's own nervous system—*shuts up*.

This morning was one of the best. I had a solid group of long-time studio musicians, and though some of them could certainly drink and talk and stay up late, they all cared more about the music in themselves than about their being in music.

I had really only intended this first day to be one of introducing the new stuff, but people got it quickly, and it turned into a long, happy jam session. We worked till late afternoon; I chose to walk the two kilometers home, to clear my mind and get mentally away from work.

I had concentrated so much all day on my memories of Yaxkintulum, with its welding-arc point of a sun, angular scribble of inscription-covered walls around broad echoing plazas, ferocious gravity and heat, and deep indigo sky, that I drank in every moist molecule of the gentle classic curves of Noupeitau, under low glowing pink nimbus, with a gentle drizzle falling.

Soggy from that walk, I stripped off my clothes into the chamberlain's hamper, told it to clean and press them, put on a robe, and went upstairs.

The sight of Paxa curled on the bed, hugging her knees to her chest, could not have hurt more if she had been dead.

I sat down next to her, my back just touching hers, and brushed her cheek with my fingers. "You're UT?"

She stayed rigid. "Yes."

I rested one hand lightly on her neck, palm pressing just enough to let her know I was there, fingers stroking her jaw through her soft gold-blonde hair. The last daylight stole away from the high windows far above the bed. The noise of the street segued from people going home, into a late-tea and visiting-with-family lull, and then into the noisy chaos of people going out for cabaret and late supper.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I sat beside Paxa, or held her, or just kept a hand on her shoulder or back, shifting position now and then. Sometimes she would squeeze my hand, or pull it around to rub her face on it. Darkness wrapped us.

She was holding my left hand tightly in both of hers. It had been playing all day and was tired and sore, but I didn't protest.

I felt her soft moist exhalation against my palm and fingertips. "I've already sent Margaret my resignation from the OSP, with a note explaining why. No more avoidable danger for me, and I was never a 'brain' agent—all I'm good at is kicking down doors, blowing things up, and jumping off roofs." She squeezed my hand. "I'm going to miss you so."

"We don't have to—"

"Are you going to leave the OSP, Giraut? I can't imagine that. And I can't stay in it. My things are already packed, and I'll be springing back to Hedonia in just a few hours.

"When I get there, I'll be going into accelerated grieving; I'm not going to spend four stanyears being depressed, the way I did after Piranesi died. I don't have the time to spend. But I will keep my new psypyx; whenever they can revive me, even if it's not till the end of next century, I want to remember my time with you." She looked up at me; in the dark I could not make out her expression. "Now, we are both naked, and I think we should make love, and cuddle and reminisce, before I go. After that I think it will only be harder if we com each other or write. Promise me something?"

"Anything, *midons*."

"Promise me you'll praise the household robots and aintellects often, and not punish them harshly, especially not for honest mistakes. They're all so afraid to be left alone with you."

I opened my mouth to object and she grabbed my head and kissed me. I decided that I had promised.

Three hours later, Paxa's soft cheek brushed against mine, her scented hair gliding over my bare shoulder. She kissed me, firmly, and walked into the gray glow.

The springer field turned off; I stood facing a black metal plate on the wall.

On my way back to bed, I asked my personal-manager aintellect to notify the musicians that tomorrow's sessions were cancelled, and made sure I thanked it.

The bed still smelled of Paxa. I told the robots to change the bed and clean everything. I thanked them, too. Perhaps this could just become a meaningless habit.

I ordered coffee in the bathroom, showered, shaved, and dressed. I would take a brisk walk through the sleeping city, to the studio, and throw myself into the absorbing job of mixing and arranging.

The com chimed and announced that Margaret wanted to talk with me. "I'll take it in the main room," I said, trotting down the stairs. "Uh, thank you."

My ex-wife's face, several times life size, waited for me on one wall.

"Margaret."

"Giraut, I had to know if you were all right."

"As all right as I can—" For some reason, I suddenly couldn't breathe. I was drenching my face with tears. Really, I hadn't thought . . . I just needed to ask Margaret for a moment to compose myself, that was it. I rubbed my face hard with the heels of my hands and looked up at the screen.

Margaret had hung up.

The bedroom springer whistled—override emergency entry; someone outside the house had taken command of it. I had lunged halfway across the room toward my nearest weapons cache before I heard Margaret heaving and gagging. Noble intentions had not excused her from springer sickness.

I grabbed two towels from the rack

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

in the bathroom and went up. She accepted a towel and scoured at her face as I mopped mine.

After another deep breath, she hugged me. "Rank hath its privilege," she said. "I was worried about you and I decided that it was *worth* the taxpayers paying very-short-notice prices, for enough energy to melt a small mountain, so I could spring here."

"There's not much you can do," I said. "She's gone. And I have to admit her reasons make sense."

"There's not much I can do, but there's something I owe you, and if I don't give it to you now, I'll never have the nerve. I remember how betrayed you felt when you learned about the secrets Shan and I kept from you. I have kept one small secret, and now I can tell you, and I feel you have the right to say I was wrong."

My blood froze. When we had been married, Shan had used Margaret's affair with a politically unreliable coworker to spy on opposition groups on Briand, and of course neither of them had told me. Margaret knew me well enough to know that the mere mention of secrets, kept by her—or by my boss, which she was—would be terrifying. "Tell me," I said.

"I knew this day was coming," Margaret said quietly, "for ten stanyears. Agents don't know their mind-body type unless they ask for it and pay for it. But we always do; we have access and whenever an agent records, we type them. And we save a backup, concealed from the agent, of every psypyx recording. We started doing that when we lost Piranesi and Shan, both, permanently. So I knew she was UT, Giraut."

I stared at her. "And you didn't tell her?"

"Would it have made a difference?"

"Well, of course," I said, losing my temper. "She would never have spent the last fifteen stanyears with me, doing all this wild, dangerous OSP stuff."

"And that would have been *good*? Would you *really* rather she hadn't? Would she? You know she decided to keep the memory."

"She has a name."

"Yes, Paxa does. I'm sorry if I don't say it often enough for you. Don't avoid my question. Would you have been better off without her love and company? Would she have been better off sitting on the beach in Hedonia, playing very safe sports? Would you like to have missed each other, or do you wish that right now you were sitting down to a game of gin rummy with her? Tell me you'd rather have any of that happen, and go ahead and hate me if you want. But I couldn't ask your permission, and I knew and had worked with both of you, so I picked the pathway I thought would give you both a chance for some happiness, which god knows you were both entitled to. So I kept my mouth shut about Paxa's condition. That's the secret I kept from you, hate me for it or not, and that's why."

I stared at Margaret. There are times when it's impossible to argue with my ex-wife. "I—all right, it worked out. But you couldn't know—no one could—that it would work out."

Margaret shrugged but her eyes stayed locked with mine. "You have just defined what I hate about my job, but that is my job. I know you always thought I was jealous of her." She got the kind of odd little smile people get at a funeral when they think of a funny story about the dead person. "All right. I was. Even though I knew how foolish that was. But I also knew you two were good for each other, and that was more important, so as long as Paxa wasn't looking at her psypyx recordings, I figured that was a vote for not knowing—and I didn't tell her, or anyone."

"And you are telling me now because—"

She wavered, just a little. "Because now it cannot cost you the best thing in your life anymore. Because now that the secret is out, you're entitled to

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

know everything. Because you have a right to know, and to confront me and be angry about it, if you want. Here I am, scream at me and spit in my face if that's what you feel like. But—all those stanyears ago, I thought you had a right to some happiness with Paxa. So, then. You did have those fifteen stanyears. One, I'm glad you had them. Two, I'm so glad you didn't find out because Paxa got killed, because this way was bad enough. And three, whether or not you ever thank me, you're welcome to those years with Paxa."

She turned to shove her crash card into the springer, to return to her office on Earth. Before she could, I said, "Thank you. You're right."

I had had fifteen stanyears of mostly joys, ending in one bitter grief; the grief could have come at any time, or could have waited longer, and would not have been easier, or harder, to bear if I had known it was coming.

And it did not make the joy less real.

"Can you stay a little while?" I asked, afraid my voice might sound like a little boy's.

Until dawn, one of the most powerful people in human space took several hours off to watch me pace and listen to me rant, sometimes to her, sometimes at her. We both knew that nothing I said really meant anything, that it was her listening and not my speaking that counted right now, and we knew what her listening said without either of us having to say the embarrassing words.

When I finally ran down, she steered me back upstairs, told me to send notice to the musicians to extend their break indefinitely, authorized the OSP to pay them for their idle days, and said, "Now go to bed and stay there, and don't set any alarms." She was right, as she so often was, so I only argued for about five minutes, before accepting a final hug, tumbling into bed, and sleeping like a dead man. ■

VISIT OUR WEBSITE
www.analogsf.com

Don't miss out on our lively forum, stimulating chats, controversial and informative articles, and classic stories.

Log on today!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE REFERENCE LIBRARY Tom Easton

Accelerando, Charles Stross, Ace, $24.95, 390 pp. (ISBN: 0441-01284-1).

Here, There & Everywhere, Chris Roberson, Pyr, $25, 285 pp. (ISBN: 1-59102-310-6).

Fall Girl, Pierce Askegren, Ace, $7.99, 247 pp. (ISBN: 0-441-01297-3).

From the Files of the Time Rangers, Richard Bowes, Golden Gryphon Press, $24.95, 268 pp., limited edition (2000 copies) (ISBN: 1-930846-35-5).

The Emperor of Gondwanaland and Other Stories, Paul Di Filippo, Thunder's Mouth Press, $16.95, 370 pp. (ISBN: 1-56025-665-6).

Lint, Steve Aylett, Thunder's Mouth Press, $14.95, 225 + xiv pp. (ISBN: 1-56025-684-2).

The Bradbury Chronicles: The Life of Ray Bradbury, Predicting the Past, Remembering the Future, Sam Weller, Morrow, $26.95, 384 pp. (ISBN: 0-06-05481-X).

Radical Evolution, Joel Garreau, Doubleday, $26, 384 pp. (ISBN: 0-385-50965-0).

Conflict in the Cosmos: Fred Hoyle's Life in Science, Simon Mitton, Joseph Henry Press, $27.95, 401 + xviii pp. (ISBN: 0-309-09313-9).

Charles Stross does love the cornucopian vision of the future promised by the nanotechnology enthusiasts and their dreams of assemblers, utility fog, programmable matter, artificial intelligence, mental uploads and downloads, and the Great Singularity or Spike looming in the perhaps-not-too-distant future. The basic idea is a shift from an economy of scarcity (today's economy) to one of abundance. How will we make a living? No problem, for living and a great many trimmings besides are free. How do we find value for our lives? That will take some discovering, but some people have already begun to search.

Manfred Macx, for one. As **Accelerando** opens, we learn that he is one of those folks who shed ideas the way the rest of us shed dandruff. He could be rich, but he's into giving things away, making others rich. In return, he need never buy an airline ticket, pay for a hotel room or a meal, or do without anything he desires (not that he desires much other than a suitcase, a full kit of electronic Net-ware, and his Japanese robokitty, Aineko). He does people favors, they do him favors. Works for him.

Though it gives his dominatrix fiancée Pamela fits. She works for the IRS and thinks he should settle down, become a billionaire, and pay his IRS-estimated tax bill (Hey fella! You don't live like that without an income! Give!). So she jumps him to harvest his gametes and ensure a continuing supply of characters for the rest of the novel.

Meanwhile, Manfred has got a call from an AI grown from a simulation of a lobster's nervous system. It wants to escape durance vile. Fortunately, an acquaintance, Bob Franklin, needs a way to operate (cheaply!) robominers in the Belt. Manfred introduces the two, and now it's time to jump ahead a bit. Aineko is getting smarter—it's upgrade-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

able, and Pamela has a tricky habit of hacking it every chance she gets. Their daughter Amber is itching to get out from under Mommy's very controlling thumb, and fortunately Daddy has a scheme: Sell herself as a slave to a corporation owned by herself, and run like mad until she's on a Franklin Trust (Bob Franklin died, but he had followers who now run his software in their own skulls) orphanage ship heading for Jupiter, there to mine and grow rich.

Pamela sics lawyers on her, but Amber is Manfred's kid, and besides, she's got the cat. There are also tantalizing hints of ETs in the distance, and before long Amber and a few friends are riding a ship the size of a beer can out to an interstellar router, of all things. Meanwhile, back home, the Singularity is in full swing. The inner planets are being dismantled and turned into computronium, and there really isn't much room left for plain folks like thee and me.

Not that Stross's tale is done yet, but you get the idea. *Accelerando* can't possibly live up to the flap copy (what the heck is "an ideological tour de force"?) but it's packed with loads of technophilic extrapolation and action, albeit of a sort already familiar to SF readers. Stross tells the story with panache, sprinkles in plenty of in-jokes for the fans, and throws so much legal, corporate, and economics bafflegab around that the suspension on your beliefmobile may, like mine, creak quite alarmingly. But if it doesn't collapse on you, you will wind up with a touchingly homey ending on the brink of forever.

Keep an eye on the cat, though—and don't trust it for a second!

The publisher touts it as a wondrous redefinition of SF, a new literary form for the twenty-first century, but Chris Roberson's **Here, There & Everywhere** feels like a fix-up that didn't get fixed enough. Roberson is well known for his short fiction, and this tale began as a novella called "Out of Joint." Later, for publication as the short novel *Any Time at All*, he added 25,000 words. Now, with another 25,000 words in the package, we have a tale that begins as the producer of a film on the Beatles notices that a particular woman, always the same age, always wearing the same sort of clothes and backpack, appears in photos spanning decades. And when he goes to a press conference, there she is.

But she vanishes with a flash of light, and producer and Beatles are never heard from again. Roberson shifts focus to the childhood of Roxanne Bonaventure, a precocious kid whose physicist daddy responds to her difficulties at school (when she spouts the many-worlds interpretation of quantum mechanics, her teachers accuse her of spouting lying nonsense) by shipping her off to America. There she has a strange encounter with an old lady who gives her a strange device, a "Sophia," which bonds irremovably to her arm and, it eventually turns out, lets her travel in time, space, and the many alternate worlds of the "Myriad." It's pretty obvious who the old lady is, and Roberson is quick to mention Heinlein's "All You Zombies" before anyone can hold it against him.

When Roxanne grows up, she becomes a dedicated explorer of the Myriad. She encounters Sherlock matches, meets kings and queens and other time travelers, visits worlds occupied by sentient dinosaurs and mice, and so on. She's a nice enough person who does not take advantage of her powers, but her sole purpose seems to be to take notes on everything she sees. Her life is essentially pointless, at least when viewed from within. But her life is also an exercise in viewing from without, and there are enough mysteries in her life—primarily where the heck the Sophia came from—to make one wonder whether the point of her life can only be seen from without.

As indeed it turns out. Unfortunately, the ending involves a classic *deus ex*

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

machina. If the beginning felt like a "forethought" with no real connection to the rest of the story, then the ending feels like an afterthought. It imposes sense on the tale, but not very satisfactorily.

In **Fall Girl** (the sequel to Pierce Askegren's *Human Resource*, reviewed here in the July/August 2005 issue), Erik Morrison is now the head of the *Ad Astra* project. Not that anyone's going to the stars, but the discoveries of the last book have people hot to visit the fringes of the Solar System, and that calls for newer and mightier spaceships than anything building the lunar settlement has called for to date. Of course, that lunar settlement, Villanueva, is still a corporate dystopia, and folks like Enola Hasbro get the shaft with hardly a second thought, especially when they get on security's list of people who might have something to do with Wendy Scheer, she of the inhuman gift of getting people to like her and do what she wishes to please her. Fortunately, Enola gets a new job with the local news just in time to help cover the results of a bomb explosion in Villanueva's central shopping district.

A bomb? Well, sure. Erik's heading up a project that is none too popular. Terrorists say they set the bomb to protest the waste of money. But there are some strange people floating around, not least the media producer who hired Enola and his physically very competent "assistant." And everyone's going to be on hand for the dramatic pour of molten metal into the engine molds for the new ship.

Nothing could go wrong, right? But right from the start—just look at the teaser copy on the page just inside the cover—you know there'll be another bomb. The fun's in getting there, and when it's all over you'll be looking forward to the next.

If you have enjoyed Kage Baker's tales of "The Company" (e.g., *The Life of the World to Come*, reviewed here in April 2005), you should also enjoy Richard Bowes' **From the Files of the Time Rangers**. It's a mosaic or "fix-up" novel, meaning that a number of its pieces first appeared as shorter works in the magazines. More pieces are original to the book. And if the whole sometimes feels a bit unintegrated, that is in the nature of the mosaic form. Overall, *Files* works nicely.

The Time Rangers trope isn't new. SF has had an enormous number of tales involving time travelers who manipulate the time stream in order to ensure or avoid particular futures or to cultivate particular timelines. But Bowes has a different angle. Many of his characters represent the ancient gods of Greece—Zeus, Athena, Apollo, Dionysius, Mercury, and so on—not all of whom share the same tactics. The ultimate aim is to prevent or delay a future in which humanity is replaced by machines and, because the lives of the gods depend on those of their creators, humanity, the gods are dead.

Some Rangers simply do the gods' bidding. Some are actual avatars. All travel up and down and across the stream of time by twisting a spiral ring, singing a snatch of song, and grabbing a bit of momentum from whatever is moving in their vicinity. *Files* opens as cadets Nancy Brown, Jake Stockley, and Ed Brown travel so to the Transept of Death, where Lady Olivia Wexford, legendary as a Bacchante who dances with Lord Riot (Dionysius) to destroy cities and worlds, is being brought back from death. Time Rangers serve the Lord of Reason, Apollo, but their mission on this day is to escort the Lady.

Later, they will take on the task of protecting and cultivating a political family and its final scion, Timothy Macauley, who will become U.S. President twice and, perhaps, represent the last, best hope of the human future. All does not go smoothly or logically, for the gods

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

work often at cross-purposes and always at whim, but there is an inevitability to the tale that suggests that the Fates, whom we never see as gods, must nevertheless be at work behind the scenes.

Recommended.

Paul Di Filippo's latest collection, **The Emperor of Gondwanaland and Other Stories**, serves up a bouillabaisse quite worthy of the author of *A Mouthful of Tongues* (reviewed here in January 2003). The stew is also as strange as one made of the sorts of things one might have found in the waters lapping the edges of the ancient supercontinent, but the title story has less to do with the Earth of eons ago than with the weirdness one can find online. The protagonist is a nerdy drone who discovers micronations—fictitious realms that issue passports, stamps, and currency and whose "citizens" claim for them status equivalent to France or Bulgaria in the real world. (You can visit the League of Micronations at http://lom.4t.com.) He discovers a discussion forum in Gondwanaland, offers his opinion on the imminent death of the emperor, and finds that he has a chat buddy. Before long he is in love with said buddy. But when she invites him to visit and offers a Gondwanaland address, quite as if Gondwanaland were the real world, what's the poor fellow to do?

Paul's having fun, and he does it with an infectious laugh that will soon have you thinking he runs a heckuva party.

Steve Aylett was named a finalist for the Philip K. Dick Award for his novel *Slaughtermatic*. Now he tries to convince us that he deserves the Dickian mantle with **Lint**, a fictional biography of a fictional and highly eccentric writer who has some Dickian affinities. Subject Jeff Lint does not receive infusions of gnostic wisdom via pink light beams from space, but he does have a continuing obsession with color and late in life "gem-yellow eye blasts kicked neon through his head."

Yet Dick fans may well take offense, for Lint's stories are remarkable for pointlessness, plotlessness, and senselessness (one critic wonders how fast he was going when he hit a story). Quotations betray resonances with the most cryptic of blank verse, perhaps assignable to his association with the Beats. Surprisingly, editors did buy his work, perhaps because they just wanted to get this lunatic out of their office (he had the idea that one must wear a dress when delivering a manuscript), and fans—some, anyway—grew quite obsessive in their attempts to extract meaning from his gnomic prose.

SF fans can take offense too, for Lint's career begins in the forties with a sale under the pen name "Isaac Asimov." If this does not strike you as a derisory comment on the real Isaac, consider the names of some of the magazines Lint sold to: not just *Amazing*, *Startling*, and *Astounding*, but *Troubling Developments, Tales to Appall, Baffling, Useless, Terrible, Awkward, Beyond Absurdity*, and *Pull the Other One*. Do they reflect a jaundiced opinion of SF and its history? Or a loving if satiric opinion? I suspect the latter, for Aylett displays a deep familiarity with the history of the genre, its writers, and its fans, and elements of Lint's career echo elements of the lives of many writers besides Dick. Further, the magazine names, the senselessness of the Linty oeuvre, and the looniness of the fans can be taken as echoing the larger society's opinions in the matter rather than Aylett's.

Is he satirizing SF itself? Or the larger society's misperceptions of it? Perhaps the greatest difficulty with Aylett's effort is that he never really makes it clear what his target is. As a result, *Lint* is a struggle to read, though one cannot help but admire the effort and dedication that had to go into writing it.

Sam Weller's **The Bradbury Chronicles: The Life of Ray Bradbury, Predict-**

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ing the Past, Remembering the Future suffers from no such ambiguities. Weller begins by admitting frankly that he is a lifelong Bradbury fan. He then delves into his subject's childhood and genealogy (an ancestress stood trial in the Salem witch trials), early efforts and mentors, and the long life of achievement and recognition. The tale is well and smoothly told, but the tone is distinctly adulatory. The reason lies partly in Weller's fanhood, but also perhaps in the nature of Bradbury's gift. Unlike the bulk of SF and fantasy which indeed drew the accusations of pointlessness, plotlessness, and senselessness which Aylett mocks, Bradbury's work was rooted in home-town America and it made sense not just to fans, but to everyone. He was accessible, and it didn't take long for him to move out of the pulps and into the mainstream. The book ends in November 2004, when President George W. Bush gave Bradbury the National Medal of Arts.

That level of recognition is unique in the genre. Those writers who aspire to anything similar might do well to read and compare the Aylett and Weller books.

Those of us who read SF have heard of nanotechnology, artificial intelligence, robots, silicon adjuncts to the brain that let people control prosthetic limbs or machinery, mental up- and downloads, memory boosters, life extension, post-humans, transhumanism, and the Singularity or Spike. If we also read the science news (*Technology Review, Scientific American, New Scientist*, and the like), we know that much of what we are accustomed to seeing in fiction exists in embryo already. It's in the lab, or even in commercial prototype. But it's not in a store near you—yet!

Most of the rest of the world hasn't a clue, for the stuff that fascinates *us* tends not to get into the daily news until it is a lot closer to the store. These are the people who will pick up journalist and futurist Joel Garreau's **Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies—and What It Means to Be Human** and experience a major WOW! moment. They just aren't prepared for talk of how genetic, robotic, information, and nano technologies (what Garreau calls the GRIN technologies) are about to enable engineered humans with such startlingly new capabilities that they transcend human nature and may no longer be "human" in any traditional sense. The consequences may be quite utopian or quite catastrophic (Bill Joy has written that robotics, nanotechnology, and genetic engineering threaten to make humanity extinct; thus research into these areas should be cut short immediately).

People fear potential catastrophes. But the idea of transcending human nature *really* gives them the willies. The idea that humans might turn themselves into something that isn't really human anymore is frightening. So is the idea of people becoming somehow unnatural, which has driven protests against vaccines, antibiotics, organ transplants, and assisted reproduction, among other things that go against the traditional "natural order." It provides the rhetoric being used against the idea of changing the body with such things as computer implants and genetic engineering. Yet, says Garreau, human nature is not just a matter of doing things the same way we always have. It is human nature to search for meaning, to better ourselves, to be creative, and to devise rituals to validate our actions. Given this, whatever we do with the GRIN (and other) technologies *is* human nature.

We might also note that in the search for whatever it is that makes humans uniquely human in a world full of our animal cousins, people have suggested communication, speech, tool-using, laughter, and several other things, all of which soon turned out to have parallels in animal behavior. The differences are

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

of degree, not kind. But there is one thing we do that other animals don't: If we have a tool, a language, a religion, a costume, a recipe, a political system, we tinker with it. We change it. We do *not* leave it alone. Thus, if we wind up changing human nature, well, that's human nature.

Garreau's writing is smooth and convincing, and his book is an excellent summary of the technological developments that will shape the lives of the next generation. Recommended.

Fred Hoyle invented the "big bang" term, played a major role in the development of astronomy and astrophysics, championed continuous creation and germs that fall from space (*Diseases from Space*, with Chandra Wickramasinghe), and in general was a seminal fellow with a gift for controversy. Why, he even wrote SF (*The Black Cloud* and *A for Andromeda*)!

Simon Mitton's **Conflict in the Cosmos: Fred Hoyle's Life in Science** tells the story, from his origins in poverty to his success at the University of Cambridge to his eventual status as outcast. Along the way, Mitton makes it clear that Hoyle was a fascinating fellow who deserved better treatment from his peers (perhaps even including a Nobel Prize) than he received.□

IN TIMES TO COME

Our December issue leads off with something a bit unusual for us: an alternate history by perhaps the world's leading practitioner of that special subgenre. As you may have noticed, *Analog* seldom uses alternate history where the change leading to a divergent past is as small and human-specific as the outcome of a battle, or even a war, going a different way. But once in a while, you may have also noticed, we do feature an alternate history where the change is a bit bigger, as in Harry Turtledove's "sims" series some years back, wherein the first European visitors to the New World found not the people we call "Native Americans," but a different and older form of hominid entirely—and a whole "new world" that went with that change. Well, Turtledove has done it again, with a novella called "Audubon in Atlantis"—and that title means *exactly* what it says!

Fran Van Cleave, whose checkered past includes experience as a pharmacist, reports on possible uses of testosterone replacement as therapy that go way beyond the ones everybody knows and jokes about. We'll also have stories by Larry Niven, Robert J. Howe, and Carl Frederick, and something for the season from Scott William Carter. Plus, of course, Part 2 of Karl Schroeder's serial *Sun of Suns*.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

BRASS TACKS

Dear Dr. Schmidt,

The last paragraph of your June editorial coincided with some things that have been bothering me for some time. Since cutting down on consumption requires significantly less change than windmill farms or "the hydrogen economy," why are the others so popular in certain circles?

(There was a builder in the Chicago region more than fifty years ago who provided houses that conserved heat so well that he sold them without furnaces, but with the guarantee that he would install a furnace if the purchaser ever wanted one. None of his purchasers ever did.)

One reason for the emphasis on futuristic energy sources, of course, is that these require changes from somebody else. If the car companies would deliver a hydrogen-burning car and the gas companies sell hydrogen at their pumps, then I can still drive to the gym to get my exercise. If the power companies would just build enough windmill farms, then I could still use all my appliances.

I think a deeper problem is that we humans envision the future as the present with minimal change. We have power grids, so our children will have power grids. Call it the "horseless carriage" effect; the men who invented the automobile—hardly unimaginative, as humans go—built things which were carriages with engines providing the power that horses had previously.

We in SF are far from innocent. Every time I look at the illustrations in *The High Frontier*, I see farms just like those in Kansas and houses just like those in Princeton.

Frank Palmer
Chicago, IL

Dear Dr. Schmidt:

Your editorial on the ecological consequences of "pollution-free" technologies was well reasoned and timely. The musings on the potential effects of large-scale wind harnessing were particularly interesting.

As every resident of the Gulf Coast knows, the west coast of Africa each summer blows low-pressure systems out into the Atlantic like a showoff uncle blowing smoke rings to amuse a child. Sadly, we in the Gulf and Caribbean are the victims of "second-hand smoke" in the form of devastating tropical storms and hurricanes.

Your essay made me wonder if it were possible to erect a series of large wind farms, with mills that could be adjusted to increase torque, and thus wind resistance. As meteorologists see hurricane-spawning systems building, the windmills could be "stiffened" to interrupt the development of the protostorms and reduce the number of systems that develop into cyclonic tropical storms.

As we are in a period of increased tropical activity and development of coastal areas grows, the economic and human consequences of land-falling storms grow more significant every year. A method to help throttle down tropical systems before they reach the warm waters of our neighborhood would be easily as valuable as the energy produced by

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

such wind farms, which could aid in the development of the countries of west and central Africa without crippling those nations with the hydrocarbon addiction that threatens our own economic well being.

As always, thank you for your thought-provoking editorials, fine fiction and solid science fact articles, a stimulating méélange that makes *Analog* a tasty gumbo for the hungry mind.

Louie Ludwig
New Orleans, LA

Dear *Analog*,

As usual, you gave me a solid batch of entertainment in the June issue, but one story inspired me to write; "NetPuppets" is one of the best tales I've read in a good while. Kudos to Richard A. Lovett & Mark Neimann-Ross for crafting a complex, entertaining and ever-so-plausible gem that delivers all the way to the end. I hope to see more work from them in the future.

Lucas Johnson
Plano, TX

Dear Stanley,

Richard Lovett's article [in the June 2005 issue], "Gene Doping and Other Olympic Scandals of the (Not-So Distant) Future," is the best single article ever written on ergogenic aids in sports. My only comment based on my forty-year opposition to performance enhancing drugs is that the article is already out of date. Sports have been heavily influenced by steroids and the like for over 50 years. Baseball was only a latecomer to the use of drugs to enhance performance. All our records and titles are the results of such techniques. If one takes a look at the physique of the former screen Hercules and 1947 Mr. America, Steve Reeves, one sees not only the most perfect and beautiful male physique, but also the ultimate in natural muscular development. Today, he would not be able to enter a local teenage bodybuilding contest. The competitors in the world's biggest bodybuilding show, the Mr. Olympia contest, are so big that they no longer look human. A friend of mine and I have often joked that the drug-fed Mr. Olympia competitors look like aliens from outer space. The Mr. Olympia contest, which was first held in 1965, has never had a natural competitor win the event. That is now two generations ago! Also, the dangers of these performance-enhancing techniques seem to grow in direct relationship to their effectiveness. Although not widely reported in the general media, deaths and strokes are common with the heavy drug using athletes (1). As Mr. Lovett points out, it is simply impossible to compete in some sports without a commitment to take these drugs. That is why I support alternative drug tested bodybuilding contests and why I must examine whether or not my children should continue to think of college level competition in some sports.

Clifford J. Ameduri, M.D.
Webster, NY

(1) Ciola, Tom, *Steroids Kill*, Axion Publishers, 2004

Dr. Schmidt,

Is there *any* field that Richard Lovett hasn't mastered and can summarize/elucidate/relevate (I invented that word) even better than its own "masters?" I always look for his name when the mag arrives: he gets read first (Sorry, Stan—*you* are always a close second choice) unless there is a "Probability Zero," of course—could there be *any* reader who doesn't read the "Prob-Zs" first?

Thanks especially for Richard's article a few months ago on suggested memories, which summarized some of Shachter's work at Harvard. With the principles at work in at least a couple of life-wrenching situations close to me, I was moved to get the Schachter book and read the full treatise.

I have just put down "NetPuppets" in the June issue—wow! (And just a side-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ways glance—how fitting for the Kelly Freas tribute to appear right there on the facing page. Layout genius!)

Now I'm eagerly waiting for Richard's analyses and relevation of two works—Jared Diamond's *Guns, Germs, and Steel*, and Karen Armstrong's *A History of God*—don't know if they're on his "to-do" list, I hope so.

John L. Fallon
Longmont, CO

Dear Dr. Schmidt,

In the June 2005 *Analog*, the appreciation of Kelly Freas on p. 131, unsigned, must be by you. It's quite wonderful, including the delicious use of "astounding."

So was Kelly.

Thank you, and for the last in the letter column being about him too. "What shall I do without him?" asks the writer, whose name, quite wonderfully, is Gray.

I suppose you get *Chronicle*, and have seen my piece, in the March issue (No. 257). Warren Lapine kindly chose to print the pictures I mentioned, and took my suggestion for the cover—three of five being from your magazine, for which I must also thank you.

Your magazine nourished Kelly. He certainly gave good exchange. Now it remains for us fans, and you pros, to continue; to cherish his work; to go on worthy of his achievement; to find and raise the like again. Somehow. Somehow.

John F. Hertz
Los Angeles, California

Dear *Analog*,

First, let me say I was gratified to read Trevor Quachri's response to Paul Basile's letter (in the June "Brass Tacks"). The explanation of how editorial mishaps can cause good writing to seem unduly sloppy was suitably apologetic and very much to the point. I can commiserate with the editors. More than once I have had the experience of spending a lot of time and effort updating a computer program and subsequently had to deal with problems that occurred because somebody had inadvertently installed an old, uncorrected version.

Second, with regard to Jeffery Kooistra's "Alternate View" column on Lord Kelvin (also in the June issue): I enjoyed the article, but I must object to the characterization of "Degrees Kelvin" as a "common mistake." It would be more polite (and more accurate) to call it an anachronism, since the use of "kelvins" instead of "degrees Kelvin" is a fairly recent change.

I can remember the first time I encountered the new unit (kelvins) in reading; I recall being amused (certainly not shocked, but surprised) by the neologism, and being mildly surprised again upon discovering that the change seemed very pervasive. I realize that "kelvins" is two syllables shorter than the earlier "degrees Kelvin," and even one syllable shorter than "degrees K."

Interestingly enough, I could find no confirmation of my memory of the older usage in my Merriam-Webster and American Heritage dictionaries. However, when I turned to a dictionary written in French, the reference was easy enough to find: a definition of "degréé K." as a "former term for the kelvin."

I suspect that however complete the changeover may seem, the old form will be around for a while—especially in writing, where the abbreviation "K" must be interpreted from context lest the reader ask, "Kilo what?" As an aside, I note that the change from "cycles per second" to "Hz" has been virtually complete for many years, but some electricians will still speak of 60-cycle current. And that in spite of the fact that the change to Hz corrected a real error, since "megacycles per second" (for example) was such a mouthful that it was always shortened to "megacyles." In the case of the kelvin, there was never any such logical reason to prefer one form to the other.

It's not a mistake; it's just old.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Happens to all of us, sooner or later!

Norm Mosher
Corinth, NY

Dear Dr. Schmidt,

What a joy to read Jack Lee Williams letter in the June edition of *Analog*! Well composed, well written and engaging. Above all else, though, it was pleasant and very readable.

In contrast, I note your comment later in the same Brass Tacks column regarding civility, or the lack of it, and I have to say I also have found an increasing trend of aggressive communications, notably on Internet forums. Like road rage, it seems that the anonymous nature of this type of communications allows some people to feel freed from the restraints of normal civilized behavior, as they are not liable to be held responsible for their actions or suffer as a consequence.

It is not limited to the less educated among us, either; I had to resign from an Alumni forum for my University, as the standard of debate was offensive to say the least.

To return to Mr. Williams' letter, I was also pleased to see that he is an engineer—as I am. As a profession, we don't have a great reputation as communicators, and here he is, proving them all wrong!

Has he considered writing for you?

Thank you for your entire magazine—even if I don't like all the contents, it never fails to make me think. (I also have a long-term pen friend through our common thread of responding to your column).

Steve Ashby
Hampshire,
England ■

We welcome your letters, which should be sent to ***Analog,*** 475 Park Avenue South, Floor 11, New York, NY 10016, or e-mail to **analog@dellmagazines.com**. Space and time make it impossible to print or answer all letters, but please include your mailing address even if you use e-mail. If you don't want your address printed, put it only in the heading of your letter; if you do want it printed, please put your address under your signature. We reserve the right to shorten and copy-edit letters. The email address is for editorial correspondence *only*—please direct all subscription inquiries to: 6 Prowitt Street, Norwalk, CT 06855.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

CLASSIFIED MARKETPLACE

Advertise in the world's leading science fiction magazines with our Analog/Asimov's combined classified section. Ad rates per issue: $2.95 per word (10 word minimum), $125 per column inch (2.25 inch maximum). SPECIAL INTRODUCTORY OFFER: Buy two ads and receive a third ad FREE. Send orders to: Dell Magazines, Classified Department, 475 Park Ave. S., 11th Floor, New York, NY 10016. Direct inquires to: (212) 686-7188; Fax (212) 686-7414 or email: classifiedads@dellmagazines.com

ANNOUNCEMENTS

Patent Attorneys - Squire, Sanders & Dempsey. Most Technologies. Contact Aaron Wininger (BS, Applied Physics, Columbia University; JD, Fordham University School of Law) at +1.650.843.3375.

BOOKS/PUBLICATIONS

Are vampires plotting to begin a nuclear war?

Where can you find prehistoric beasts roaming sunless worlds and prophecy? If predictable plots and softened scenes of horror are boring you, try a new breed of sci-fi.

MOONLIGHT'S MERIDIAN NUCLEAR TERRORISM AND THE UNDEAD
1-800-834-1803 or visit http://www.careymcwilliams.com

Arizona Science Fiction Romance. Share the love and the technology. BernardAst.net

BUYING SCIENCE FICTION magazines, book collections. Will travel for large accumulations. Bowman, Box 167, Carmel, IN 46082.

BOOKS/PUBLICATIONS

ENEMY MINE, All books in print, Check: www.barryblongyear.com

Enter the Fray: A Tale of First Contact at Amazon.com

In the eons-long warfare between bacteria and mankind, what would the world be like if bacteria won? *The Shadow of Armageddon* by Jim LeMay. http://www.silverlakepublishing.com/catalog/shadow.html

PUBLISH YOUR BOOK ONLINE, Third Millennium Publishing, a cooperative of online writers and resources, http://3mpub.com

SciFi Writers: Show publishers your work at www.kleinpublishing.com/scifi

The universe has a great secret. Read *Life Everlasting.* Visit henryblanchard.com

"Where Sleeping Cats Lie", a novel by Ella Mack. Cats are aliens. Alien cats are more alien. Come prowl at http://3mpub.com/emack/

ANALOG SCIENCE FICTION AND FACT
Classified Department 475 Park Ave South, 11th Floor New York, NY 10016
Call: (212) 686-7188 Fax: (212) 686-7414 classifiedads@dellmagazines.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

UPCOMING EVENTS Anthony Lewis

3–6 November 2005
WORLD FANTASY CONVENTION 2005 at The Madison Concourse Hotel & Governor's Club, Madison WI. Theme: The Architecture of Fantasy & Horror. Guests of Honor: Graham Joyce, Robert Weinberg, Terry Windling. Artist Guest of Honor: Kinuko Y. Craft. TM: Peter Straub. Registration: $125 until 1 June 2005, more thereafter. Info: www.worldfantasy.org; WFC2005@worldfantasy.org; WFC-Madison, Box 531, Cambridge WI 53523.

11–13 November 2005
ASTRONOMICON (Rochester-area SF conference) at Clarion Riverside Hotel, Rochester NY. Guests of Honor: Spider & Jeanne Robinson. Artist Guest of Honor: Bob Eggleton. Fan Guest of Honor: Erwin S. Strauss. Filk Guest of Honor: Roberta Rogow. Editor Guest of Honor: Robert Weinberg. Anime Guest of Honor: Steve Bennett. Special Guest of Honor: Forrest J Ackerman. Registration: $30 until 30 June 2005, more thereafter. Info: www.astronomicon.info/; chair @astronomicon.info; The Rochester Fantasy Fans, Box 31701, Rochester NY 14603-1701; (585) 342-4697.

11–13 November 2005
NOVACON 35 (British winter SF conference) at Quality Hotel, Bentley, Walsall, UK. Guest of Honor: Alastair Reynolds. Registration: £36 until 26 October 2005, then £40. Info: www.novacon. org; Steve Lawson, 379 Myrtle Road, Sheffield, S2 3HQ, UK; +44 (0) 114 281 1572.

11–13 November 2005
ORYCON 27 (Portland, Oregon-area SF conference.) Guests of Honor: Brian Herbert, Kevin J. Anderson. Special Guest of Honor: Rebecca Moesta. Artist Guest of Honor: Paul Guinan. Special Guest: Anina Bennett. Registration: $40 until 15 July 2005, $45 until 15 October 2005, $55 at the door. Info: www.orycon.org/orycon27/; orycon27@hotmail.com; OryCon 27, Box 5464, Portland OR 97228-5464.

11–13 November 2005
WINDYCON 32 (Chicago-area SF conference) at The Wyndham Hotel O'Hare, Rosemont IL. Guest of Honor: Harry Turtledove. Artist Guest of Honor: Bill Holbrook. Fan Guest of Honor: Jim Rittenhouse. Media Guests of Honor: Erin Gray & Gil Gerard. TM: Esther Friesner. Registration: $35 until 14 October 2005, $50 at door. Info: www.windycon.org/; info@windycon.org; WindyCon 32, Box 184, Palatine IL 60078-0184.

25–27 November 2005
LOSCON 32 (Los Angeles area SF conference) Guest of Honor: Stephen Brust. Artist Guest of Honor: Rowena Morrill. Fan Guest of Honor: Bruce Farr. Registration: $30. Info: www.loscon.org/; info@LASFS.org; Loscon 32, c/o Los Angeles Science Fantasy Society, 11513 Burbank Blvd, North Hollywood CA 91601. ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

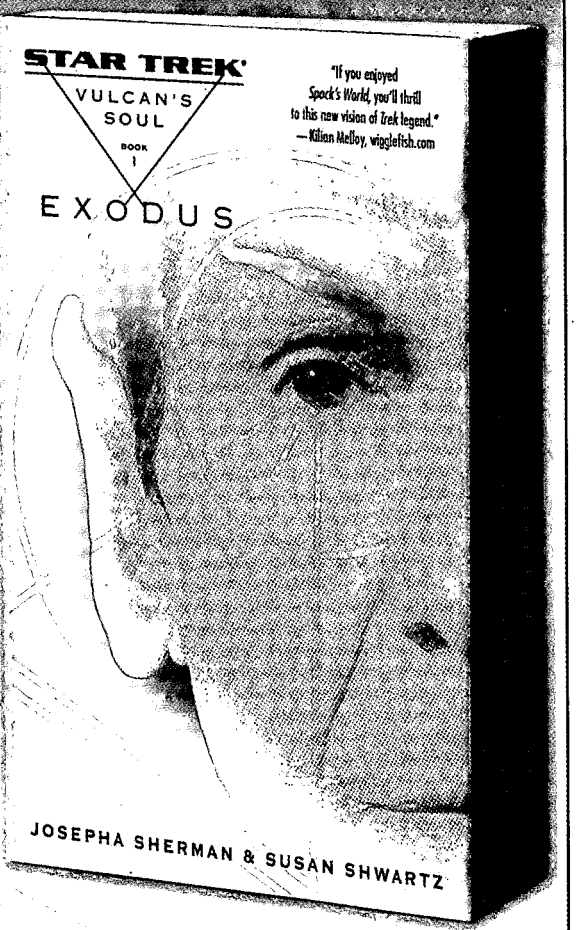
"If you think you know all there is to the planet Vulcan...think again."

—Bill Williams, trekweb.com

The Romulan Empire is under attack from a vicious enemy—and a secret buried deep in Vulcan's violent past is the galaxy's only hope for peace.

"*Exodus* leaves you wanting more."

—Jackie Bundy, treknation.com


STAR TREK
VULCAN'S SOUL
BOOK I
EXODUS
"If you enjoyed Spock's World, you'll thrill to this new vision of Trek legend."
—Kilian Melloy, wigglefish.com
JOSEPHA SHERMAN & SUSAN SHWARTZ

STAR TREK®

Published by Pocket Books
A Division of Simon & Schuster
A Viacom Company
www.simonsays.com
www.startrek.com

Also available as an eBook.

™,®, & © 2005 Paramount Pictures. All Rights Reserved. STAR TREK and related marks are trademarks of Paramount Pictures. Pocket Books Authorized User.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Explore the Universe!

Visit www.analogsf.com
& www.asimovs.com

Home of the world's leading
Science Fiction magazines.

Log on and enjoy:

- ☆ Award-nominated stories from the genre's leading authors
- ☆ Readers' Forum
- ☆ Excerpts of current stories
- ☆ SF news and events
- ☆ Book reviews

ANALOG
SCIENCE FICTION AND FACT
www.analogsf.com

Asimov's
SCIENCE FICTION
www.asimovs.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED